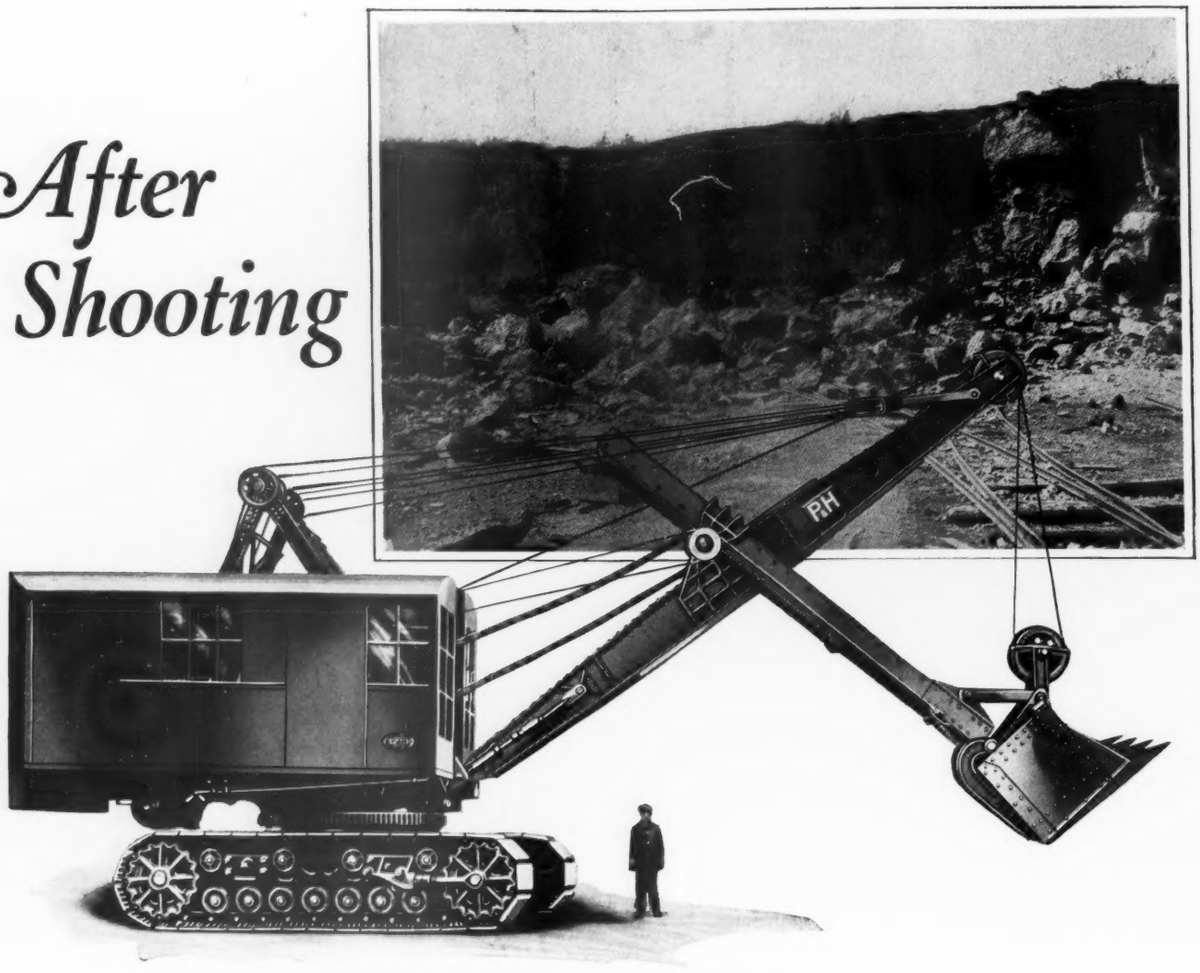
Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Chicago, July 6, 1929 (Issued Every Other Week) Volume XXXII, No. 14

MEMBER A. B. C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A. B. P.

Printing of This Issue Is 5700 Copies. Next Issue Will Be July 20



After Shooting

. . . Load Out Faster with a P & H 900

We have one Model 900 on hand for Immediate delivery

SHOOT it down and load it out. That's the program in rock. And that is where the new P & H Type 900 Diesel Shovel fits in. It speeds up rock loading. Its 180 h.p. Diesel engine, mounted directly on the unit cast steel revolving base, means tremendous power at small cost, as well as absolute reliability. Roller bearings throughout the upper deck, power clutch control and chain driven crowd, combine for fast, easy operation. All frames including the revolving deck are single piece steel castings and assure exceptionally fast line and swing speeds for a machine of this size.

With its steering brakes, it has all the mobility of a 1 or 1½ yd. machine —a feature previously unheard of in a 3 yd. Shovel. Investigate the P & H Type 900 before you purchase your next shovel. Descriptive literature on request.

Capacity 3 cu. yds.

HARNISCHFEGER CORPORATION
Established in 1884
3865 National Avenue, Milwaukee, Wis.

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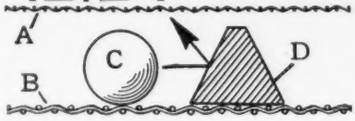
P&H DIESEL EXCAVATORS

9653

ROTEX

The popular No. 46 ROTEX with the new type R spiral bevel gear drive, shown below, has a screen surface 3 ft. by 7 ft. and quantity production makes possible the very low price of $620.00. This model includes all of the features of the larger "Heavy Duty" series, including the double balance wheel system for preventing the transmission of vibration to the foundation of the machine.



A—Screening mesh.

B—Coarser ball supporting screen.

C—The solid rubber balls flying about, due to the gyrating action of the screen box, strike the inclined surface D and are deflected upward, hitting the under side of the screening mesh.

For Producing Fine Sizes!

IN practically every plant there is a need for a screen that will produce clean, marketable grades of the finer sizes.

The ROTEX Screen No. 46 shown above is designed and built with this purpose in mind.

The nearly level gyratory motion of the screen box insures accurate sizing while the patented "ball-and-bevel-strip" mesh cleaning system (diagrammatically explained at the left) insures a continuously clean, open screen.

Of a convenient size to produce tonnage and use a minimum space, it is, at the same time, flexible in operation and ruggedly built to give good service.

This machine can probably be used to advantage in your plant. We would appreciate the opportunity of sending complete details to you.

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Volume XXXII Chicago, July 6, 1929 No. 14

Rock Products

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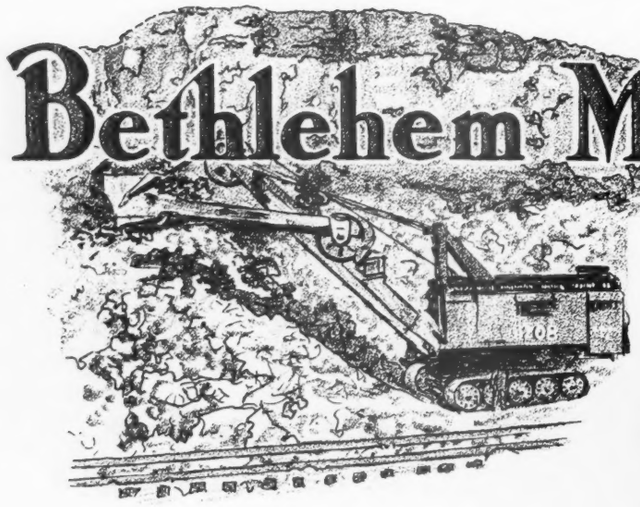
General view of the new fluxstone crushing plant at Naginey, Penn., operated by the Bethlehem Mines Corp.

Bethlehem Mines Corporation



THE BETHLEHEM STEEL CO. operates seven fluxing stone quarries under the name of the Bethlehem Mines Corp. Six of the quarries are in Pennsylvania and one in New Jersey. The former plants are operated at Bethlehem, Hanover, Steelton, Bridgeport, Lebanon—and the newest and perhaps most modern operation is at Naginey, Penn. The New Jersey operation is at McAfee.

Naginey is a small village made up entirely of employes of the Bethlehem Mines Corp., and is two miles southeast of Milroy, Milroy being the end of the Milroy and Central railroad, a feeder branch line of the Pennsylvania system; however, a spur from Milroy serves the new fluxing plant. The town of Milroy is roughly 10 miles north of Lewistown, Penn.

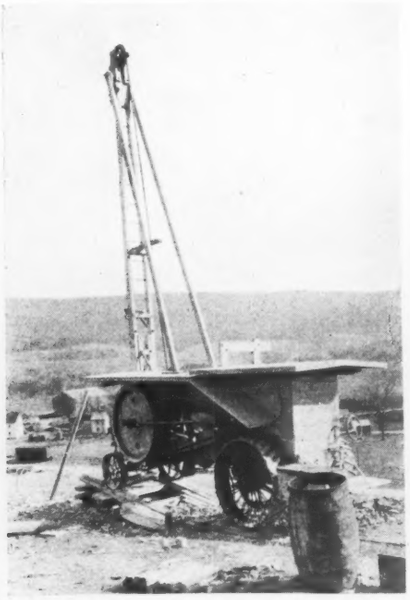
High-calcium, low-silica fluxing stone has been produced at Naginey for many years, the stone being taken from an old quarry several hundreds yards south of the present plant. This was processed in an old plant that, since the new one is in operation, has been dismantled. The older quarry is in a hillside and was operated from one bench, the floor of which is practically at the same elevation as the surrounding ground surface. The operations here were of such an extensive nature as to practically remove the entire hill at that point, and further lateral expansion was prevented by the proximity to the company's property boundary lines. However, this old quarry still has a large tonnage of high grade limestone that can be quarried by adopting a pit method of operation.

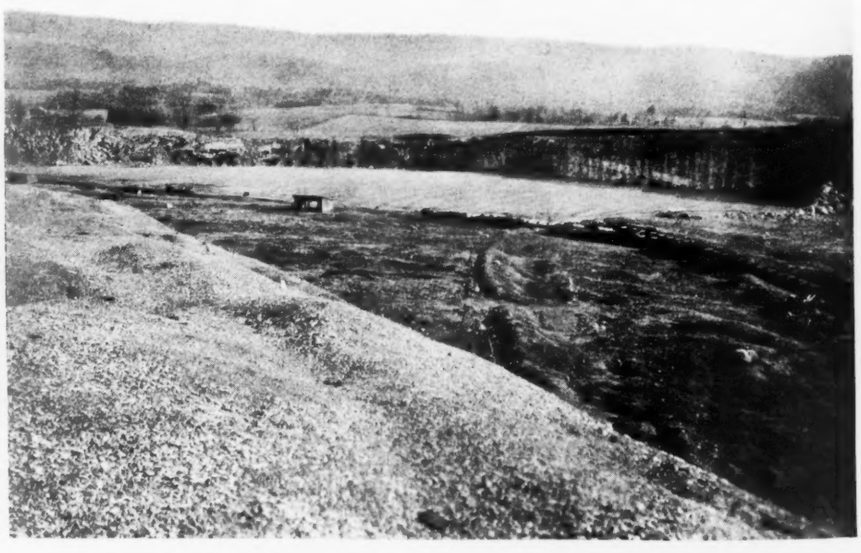
New Quarry

North of the old quarry a newer one was opened up several years ago and has been extended along the strike of the ledge for a distance of 2500 ft., and is being extended until ultimately the quarry will have a length of 4000 ft. The height of the quarry varies along this face from 40 ft. to 107 ft., with an average of 55 ft. The higher face is due to a second level or bench floor that has been following the upper bench and quite a distance back from the upper level's face.

The quarry at present is slightly crescent-shaped with the new plant at one end of the crescent and an elongation of the present quarry face is supplying a large percentage of the present stone, rather than that which might be secured the extended face; however, some stone is being taken near the crest of the crescent in an endeavor to straighten up the present more or less irregular face.

At present there is only a small amount of overburden to handle, and this is removed by teams, but as the ledge dips at an angle of about 10 deg. from horizontal, more overburden will have to be handled; this amount will not be over 3 or 4 ft., as the ground level also slopes favorably to the operation. Stripping operations will most likely be done with a dragline. Truck transportation is likely, but other ways are being studied.





Above—Drilling in new ground at the Naginey quarry. Right—Part of the old quarry, the floor of which is used to store limestone for future recovery as commercial aggregate

Builds New Fluxing Plant

This quarry, as did the older ones, produces a high calcium stone which will average 95 to 97% $CaCO_3$ and 3% silica.

Open-hearth steel operations, and the entire output of this plant is for that purpose, call for stone that will pass a 6-in. ring down to 1½-in. Anything finer than 1½-in. is at present stockpiled, but plans are now fully developed for the construction of a commercial stone screening and washing plant to reduce this tonnage of what now might be considered waste material. This new feature calls for the installation of log washers to remove any adhering clay, followed by screening over a battery of Rotex screens. The capacity of the "yet-to-be-built" screening plant will be 500 tons per day, and it is understood that this tonnage will come partly from the current production of minus 1½-in. material. Some will be taken when necessary from the enormous stockpiles that have accumulated from past operations. The stone is of sufficient hardness to meet the state highway specifications and for general construction purposes in the surrounding district.

Quarrying Practice

Drilling is done by five Loomis "Clipper" well drills, three being of the newer 44-ET type and two of an older model, all electrically driven. Holes are drilled to a depth of 5 ft. below the quarry floor level on 15 ft. centers and 25 ft. burden. At the time of inspection a blast was shot with a total of 169 holes loaded with 60, 40 and 30% powder, with the higher percentage dynamite at the bottom and the slower explosives higher up in the hole. A total of 50,000 lb. of a nitro-starch dynamite was used and was detonated with Cordeau-Bickford. It was estimated that 200,000 tons of stone was secured from this shot, or one-third of a year's production.

Here and there throughout the area are caves in the limestone, some of which cannot be seen from the face or surface, but when filling drill holes with powder, systematic measurements of the hole before and after loading often reveals these pockets, and care must be exercised to make sure that the effectiveness of the powder is not lost when shooting close to these caves. About all that can be done when one of these pockets is encountered is to place the bottom charge, and shovel in stemming until a measurement shows that the pocket has taken all the filling it can and the dust has started to fill the drill hole proper. Following this the second charge is placed on top and again filled with stone dust a certain distance, after which the third charge is placed in the hole, followed by the final stemming. It might be well to explain here that the drill holes are loaded first with a certain amount of 60% dynamite which is stemmed with stone dust and a second charge of 40% placed on top of this stemming, after which a charge of 30% is placed and the hole then filled to the surface. Before placing any powder the hole is meas-

Above—Main conveyor from the secondary crusher to the screening plant. Left—Quarry cars drawn up before the primary crusher. The cars are dumped by the stiff-leg derrick shown in the left foreground

ured and after each charge of powder and each stemming the hole is measured and the reading carefully recorded. The amount of powder, its strength and the amount of stemming separating the charge is determined by the powder company's representative in charge of the shot, who governs his decisions according to the local condition at each hole. The following tabluation gives the details of hole loading, at the conclusion of which can be found the summary of the data. One column shows a summary of the shot effecting the "cut through," which can be seen at one end of the quarry by referring to the drawing of the quarry face, and the other column refers to the main quarry face.

The upper 8 to 12 ft. of the ledge is very blocky and shattered, making it necessary to use a 6-in. steel well casing to prevent the hole from caving. These casings were not pulled prior to shooting. The holes were

BLAST RECORD OF SHOT MADE AT THE NAGINEY QUARRY, BETHLEHEM MINES CORP., MARCH 30, 1929

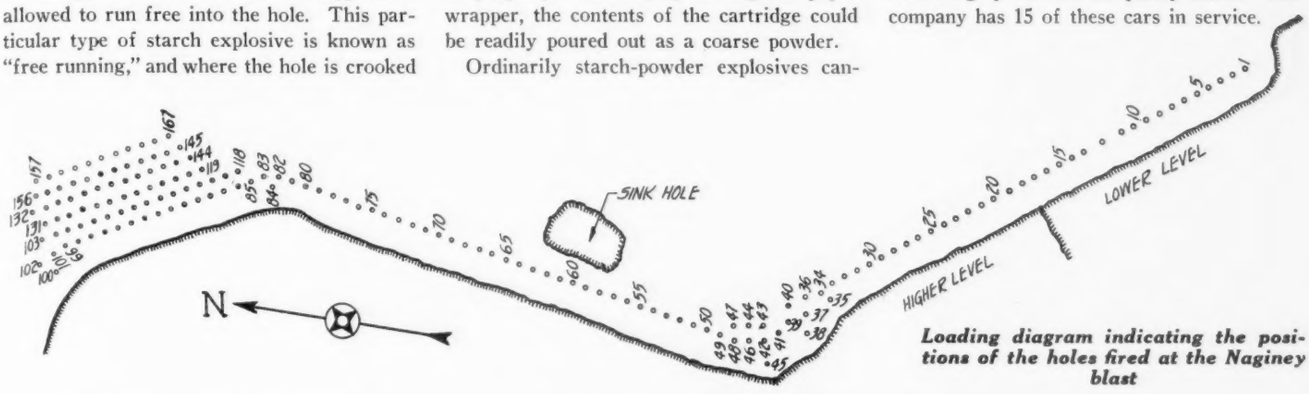
Editor's Note: Under "Notes" in this record, the figures indicate the number of cases, depth filled, and tamping. For example, 9/53/50 means that 9 cases of explosive filled the hole to 53 ft., tamped to 50 ft. "Drop" means the hole was smooth and sticks were dropped in the hole. "SC" and "DC" indicate respectively single-countered and double-countered Cordeau-Bickford fuse.

No.	Depth (Ft.)	60% cases	40% cases	30% cases	Tamping (Ft.)	Face (Ft.)	Centers (Ft.)	Hole	Notes
1	88	5	5	3	40	25	15	Drop	9/53 ft./50 ft. No. 85468 D. C.
2	89	5	5	4	40	25	15	Pour	12/53 ft./43 ft.
3	88	5	5	4	35	25	15	Drop	12/49 ft./42 ft.
4	87	5	5	3	47	25	15	Pour	10/66 ft./54 ft.
5	95	5	5	5	34	25	15	Drop	13/47 ft./42 ft.
6	97	5	5	6	31	25	15	Drop	14/47 ft./38 ft. No. 85467 D. C.
7	94	5	5	5	30	25	15	Drop	13/48 ft./37 ft.
8	97	5	5	6	31	25	15	Drop	14/50 ft./38 ft.
9	100	5	5	6	33	25	15	Drop	14/54 ft./40 ft.
10	95	5	7	5	28	25	19	Pour	14/52 ft./38 ft.
11	99	5	10	4	32	25	19	Drop	17/50 ft./40 ft.
12	102	4	12	....	35	25	16	Drop	14/51 ft./40 ft. No. 85480 D. C.
13	105	5	5	6	36	25	15	Drop	14/54 ft./44 ft.
14	106	5	5	6	35	25	15	Drop	14/56 ft./42 ft. No. 85480 D. C.
15	107	5*	5	7	37	25	15	Pour	15/63 ft./45 ft.
16	107	5*	5	6	40	25	15	Pour	13/70 ft./49 ft.
17	107	5*	5	7	30	25	15	Pour	14/75 ft./73 ft. 15/73 ft./38 ft.
18	75	3	4	3†	20	25	15	Drop	
19	76	3	4	5†	35	25	16	Drop	
20	77	3	4	5	34	25	15	Drop	
21	75	3	5	4	32	25	15	Drop	
22	75	2	6	4	32	25	15	Drop	D. C. No. 87457
23	74	2	4	5	31	25	15	Drop	8/47 ft./38 ft.
24	76	2	5	5	32	25	15	Drop	10/53 ft./38 ft.
25	74	4	4	4	35	25	15	Drop	11/52 ft./38 ft.
26	70	4	4	4	30	25	15	Drop	10/50 ft./35 ft.
27	70	2	5	5	28	25	15	Pour	4/63 ft./52 ft. 6/52 ft./48 ft. 2/45 ft./35 ft.
28	61	3	1	4	30	25	15	Pour	2/60 ft./42 ft. 4/41 ft./34 ft. Caves
29	65	2	4	4	28	25	15	Pour	8/55 ft./35 ft. No. 85467 D. C.
30	67	2	6	6	32	25	15	Pour	7/62 ft./52 ft.
31	67	2	5	2	38	25	15	Pour	4/66 ft./59 ft. 8/55 ft./38 ft.
32	60	2	3	5	29	25	15	Drop	
33	66	3	4	1	29	25	15	Drop	
34	60	2	7	....	23	....	15	3	
35	58	2	4	2	45	22	15	1	
36	53	2	4	2	24	....	15	3	
37	57	1	2	2	42	....	15	1	
38	49	1	1	3	30	23	12	1	Blocked at 37 ft.
39	49	1	2	1	37	....	12	2	
40	45	1	2	3	25	....	12	3	
41	47	1	2	3	30	31	12	2	
42	42	1	2	1	22	....	12	2	3/36 ft./26 ft.
43	43	1	2	2	21	....	12	3	
44	43	1	2	2	23	....	12	2	
45	33	....	1	1	25	12	12	1	
46	42	1	2	3	20	25	12	1	5/27 ft./24 ft.
47	39	....	2	2	23	25	12	2	
48	39	1	1	1	23	25	12	1	
49	38	....	2	2½	21	25	12		
50	39	1	1	2	29	25	12		
51	39	1	1	2½	22	25	12		
52	32	....	2	2	20	25	12		2/27 ft./24 ft.
53	37	1	1	2	22	25	12	Caves	2/32 ft./27 ft.
54	36	1	2	1	22	25	12	Caves	2/30 ft./24 ft.
55	38	1	2	2	18	25	12	Caves	3/35 ft./24 ft. 4/23 ft./19 ft.
56	33	1	2	....	21	25	12	Caves	Filled to 27 ft.
57	34	....	2	2	21	18	12	Caves	
58	33	....	2	1	31	10	12		
59	34	1	2	2	28	18	12		
60	33	1	2	1	16	18	12		D. C. No. 85704
61	35	1	2	2	25	18	12		
62	39	1	1	....	17	18	12	2	
63	37	1	1	1	12	20	12	Caves	2/37 ft./16 ft.
64	41	1	2	2	24	20	12	Drop	
65	42	1	2	2	24	22	12	Pour	
66	40	1	2	2	25	25	12	Pour	
67	39	1	2	2	27	25	12	Pour	
68	40	2	1	2	22	25	12	Mud	
69	41	1	2	2	23	25	12		
70	41	1	2	2	23	25	12		
71	41	1	2	2	27	25	12	Pour	
72	41	1	2	2	23	25	12	Pour	
73	40	1	2	2	25	25	12	Mud	
74	40	1	2	2	23	25	12	Mud	
75	43	1	2	2	24	25	12	Mud	
76	40	1	2	2	22	25	12	Drop	
77	40	1	2	2	18	25	12	Drop	
78	41	1	2	2	25	25	12	Drop	D. C. No. 85662
79	40	1	2	2	22	25	12	Pour	
80	40	1	2	2	13	25	12	Drop	
81	38	1	2	2	21	25	12	Drop	
82	41	1	2	2	17	25	12	Drop	
83	44	2	1	1	29	25	12	Drop	
84	39	2	1	1	25	10	....	Relief	
85	41	2	1	1	28	25	12		
86	39	2	1	1	25	25	12		
87	43	2	1	1	28	25	12		
88	40	2	1⅓	1	22	25	12		
89	36	2	1	1	29	25	12		
90	40	2	1	1	29	25	12		
91	39	2	1	1	25	25	12		
92	37	2	1	1	23	25	12		
93	40	2	1	1	26	25	12		
94	38	2	1	1	20	25	12		
95	40	2	....	....	23	25	12		
96	39	2	1	1	24	25	12		
97	40	2	1	1	24	25	12		
98	38	2	1	1	24	25	12		
99	37	2	1	1	20	25	12		
100	36	2	1	1	20				Front relief
101	38	2	1	1	23				Rear relief
102	38	1	1	1	24				Rear relief
103	41	2	1	1	28	12	12	2	
104	42	2	1	1	26	12	12	2	
105	43	2	1	1	28	12	12	2	
106	42	2	1	1	26	12	12	2	
107	43	2	1	1	28	12	12	2	
108	44	2	1⅓	1	28	12	12	2	
109	38	2	1	1	30	12	12	2	
110	44	2	1	1	28	12	12	2	
111	44	2	1	1	28	12	12	2	
112	44	2	1	1	30	12	12	2	
113	43	2	1	1	29	12	12	2	
114	44	2	1	1	29	12	12	2	
115	42	2	1	1	28	12	12	2	
116	45	2	1⅓	1	34	12	12	2	
117	41	2	1	1	28	12	12	2	
118	43	2	1	1	27	12	12	2	
119	45	2	2⅓	1	31	12	12	3	
120	43	2	1	1	27	12	12	3	
121	43	2	2	....	29	12	12	3	
122	45	2	1⅓	1	28	12	12	3	
123	45	2	1⅓	1	29	12	12	3	
124	45	2	1⅓	1	28	12	12	3	
125	45	2	1⅓	1	28	12	12	3	
126	44	2	1⅓	1	26	12	12	3	
127	45	2	1⅓	1	28	12	12	3	
128	44	2	1⅓	1	28	12	12	3	Drop
129	45	2	1⅓	1	25	12	12	3	Drop
130	44	2	1	1	26	12	12	3	Drop SC No. 49681
131	45	2	1	1	28	12	12	3	Drop
132	47	2	2	1	29	12	12	4	D. C. No. 85547
133	47	2	2	1	28	12	12	4	
134	47	2	2	1	29	12	12	4	
135	46	2	2	1	30	12	12	4	Pour
136	46	2	2	1	27	12	12	4	Drop
137	45	2	2	1	29	12	12	4	Pour
138	47	2	2	1	31	12	12	4	Drop
139	45	2	2	....	15	12	12	4	Blocked at 15 ft.
140	45	2	2	1	28	12	12	4	
141	43	2	2	1	24	12	12	4	D. C. No. 85558
142	48	2	2	1	24	12	12	4	
143	48	2	2	1	25	12	12	4	
144	45	2	2	1	24	12	12	4	
145	49	2	3	....	25	12	12	5	
146	48	2	3	....	21	12	12	5	
147	50	2	2	1	28	12	12	5	D. C. No. 85525
148	49	2	3	....	28	12	12	5	
149	50	2	2	1	21	12	12	5	
150	49	2	2	1	28	12	12	5	
151	50	2	2	....	20	12	12	5	
152	46	2	2	1	21	12	12	5	
153	49	2	2	1	29	12	12	5	Pour
154	49	2	2	1	28	12	12	5	Drop
155	50	2	2	1	29	12	12	5	
156	49	2	2	1	22	12	12	5	3 ft. water
157	50	2	2	1	30	12	12	6	D. C. No. 85468
158	49	2	2	1	27	12	12	6	7 ft. water
159	50	2	2	1	26	12	12	6	
160	49	2	2	1	26	12	12	6	D. C. No. 85516
161	49	2	2	1	28	12	12	6	
162	48	2	2	1	28	12	12	6	6 ft. water
163	50	2	2	1	31	12	12	6	
164	29	2	....	....	25	12	12	6	Blocked at 29 ft.
165	49	2	2	1	29	12	12	6	
166	49	2	2	1	30	12	12	6	
167	50	2	2	1	32	12	12	6	
	8358	342	395	315	4516		2125		
Avg.	51	2	2.4	1.9	27		13		

*4½x16—50% gelatin dynamite.
†4½x16—30% (one case only).

all dry so that the starch explosive could, if necessary, be removed from its wrapper and allowed to run free into the hole. This particular type of starch explosive is known as "free running," and where the hole is crooked and a full sized 5x17-in. cartridge could not be properly bottomed, by slitting the paper wrapper, the contents of the cartridge could be readily poured out as a coarse powder.

Ordinarily starch-powder explosives cannot be used in wet holes, but in this case a waterproofed cartridge is used and lowered into the hole with a suitable string, which is part of the cartridge itself.



Loading diagram indicating the positions of the holes fired at the Naginey blast

SUMMARY OF SHOT STATISTICS

	Holes not to "cut through"	Holes to "cut through"
Number of 6-in. holes	83	84
Length of shot, feet	1129	180
Average depth, feet	58	45
Average burden, feet	25	20
Total tonnage	130,164	51,840
Pounds of 60% explosives	8750	8350
Pounds of 40% explosives	13,300	6450
Pounds of 30% explosives	11,950	3800
Total pounds explosives used	34,000	18,600
Tons of rock per lb. explosive	3.8	2.8
Approximate feet of S.C. cordeau		2900
Approximate feet of D.C. cordeau		6000
Approximate feet of plain cordeau		2400

SUMMARY OF "CUT THROUGH"

		Explosives used
Number of 6-in. holes	84	
Length of shot	180 ft.	167 cases 60%
Average depth	45 ft.	129 cases 40%
Average burden	80 ft.	76 cases 30%
Total tonnage	51,840	Total lb., 18,600

Tons per lb. of explosive, 2.8.

SUMMARY OTHER THAN "CUT THROUGH"

		Explosives used
Number of 6-in. holes	83	
Length of shot	1129 ft.	175 cases 60%
Average depth	58 ft.	266 cases 40%
Average burden	25 ft.	239 cases 30%
Total tonnage	130,164	Total lb., 34,000

Tons per lb. of explosive, 3.8.

TOTAL TONNAGE	NUMBER HOLES
130,164	84
51,840	83
182,004	167

Loading and Transportation

The bulk of the stone is loaded by a 3½-yd., 120-B Bucyrus-Erie electric shovel on crawler treads with a 1½-yd. Marion electric as an auxiliary. These shovels load into large ore cars that were designed to hold 70 tons of iron ore and were part of the equipment manufactured for the Cuba Iron Mines. These cars are side-dump type and hold roughly 55 tons of quarry stone. The company has 15 of these cars in service.

Transportation is by means of two General Electric 35-ton locomotives, which operate on 550 volts, direct-current power from an overhead trolley using a 600-ft. automatic cable reel. The rock cars are hauled to the 48-in. Traylor gyratory primary crusher in trains of three to five cars, and are dumped by means of a double-lift functioning to first open the side door vertically, after which by continuing to raise this door the

The large powder magazine of modern theft-proof features holds a carload of explosives

Up to a comparatively recent time the company planned its own blasting, but a policy has now been adopted of allowing the different powder companies to demonstrate their methods and materials. This particular shot was under the direction of Henry Scheese, quarry explosive expert of the Trojan Powder Co., assisted by F. A. Schmoyer. Mr. Brunell of the Atlas Powder Co. and Mr. Tritchler of the Peerless Explosives Co. were present as representatives of their respective companies.

Powder is stored in a magazine located in a ravine some distance from the plant and quarry, and is of sufficient size to hold a carload of explosives. The steel doors of this magazine are provided with a double-lock arrangement, it requiring two keys to open the doors, so powder thieves find very little encouragement here.

Loading free-running starch dynamite in a shattered hole. Henry Scheese, expert for the powder company, who supervised the loading, is at the left

Starch explosives encased in waterproof jackets are loaded to the wet holes. The strings are part of the cartridge and serve to lower the powder into the drill hole

body of the car is also raised, allowing the contents to drop into the crusher.

There is a considerable lift necessary to dump these large steel cars and the operation is performed by a four-drum Clyde Iron Works hoist, through a stiff-leg derrick and a six-sheaved lifting block. The main drum of the hoist is for the lift line and the other three drums are for raising or lowering the derrick boom, racking and for handling a second smaller auxiliary lift sheave. As the dumping operation calls only for raising and lowering of the main sheave block, the other drums are seldom used, but the gear trains driving these drums operate all the time.

A second stiff-leg derrick is also at the crusher and is used for dislodging boulders and for crusher repairs. Both of these derricks are substantial and stockily built. The larger crane is direct-connected to a 112-hp. General Electric induction motor, and the smaller, a three-drum hoist, which is an American Hoist and Derrick Co. product, is direct-connected to a 40-hp. Westinghouse, type G.W., 220-volt, 865-r.p.m., slip-ring, induction motor.

Portion of the face before shooting. This shows only a few hundred feet out of a total length of 4000 ft.

The same face (see above) after the shot. About 50,000 lb. of explosive was set off to break down 200,000 tons of rock

No operator is required at the larger dumping hoist, as an ingenious device has been attached to the controller so that by means of two cables and a small reel that replaces the handle of the control, the crusher men can direct the dumping operation.

Both hoists are housed in substantial steel buildings amply provided with nonbreakable window glass.

Crushing Plant

The primary crusher is driven by a 200-hp. General Electric, slip-ring, induction motor by means of a 16-in. rubber belt. The discharge product, minus 6-in., is received by a 42-in. Jeffrey belt conveyor inclined at 18 deg., 182 ft. center to center, driven by a 60-hp., 2200-volt, 600-r.p.m., General Elec-

Showing the blocky nature of the upper strata of the deposit at Naginey

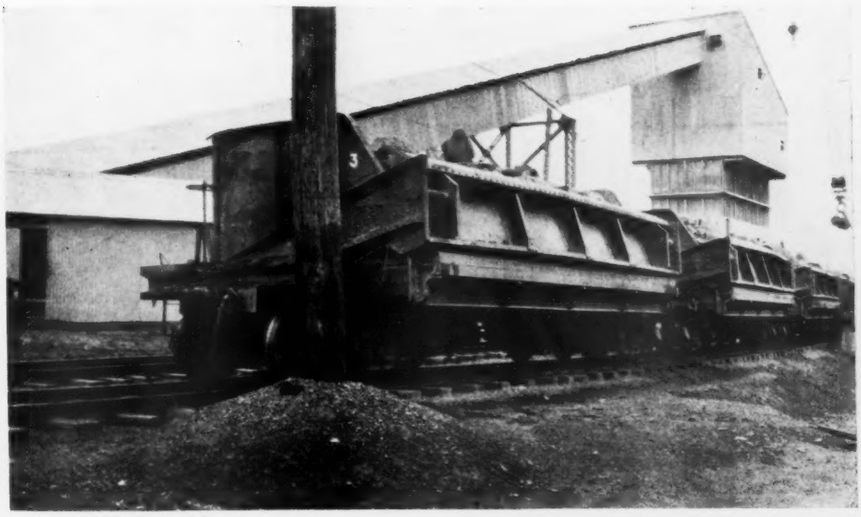
Loading quarry stone to the 50-yd. all-steel, side-dump cars

tric, induction motor through a Foote reduction unit with a ratio of reduction of 21.6 to 1. This belt conveyor discharges to a self-cleaning grizzly spaced at 5-in. openings.

Oversize from the above grizzly falls to an Allis-Chalmers, 8-K, gyratory crusher set to discharge a 4½-in. product, and this crushed product joins the fines from the grizzly on a second 18-deg. incline, 42-in. belt conveyor, 290 ft. center to center. The

Self-cleaning grizzly placed before the secondary crusher

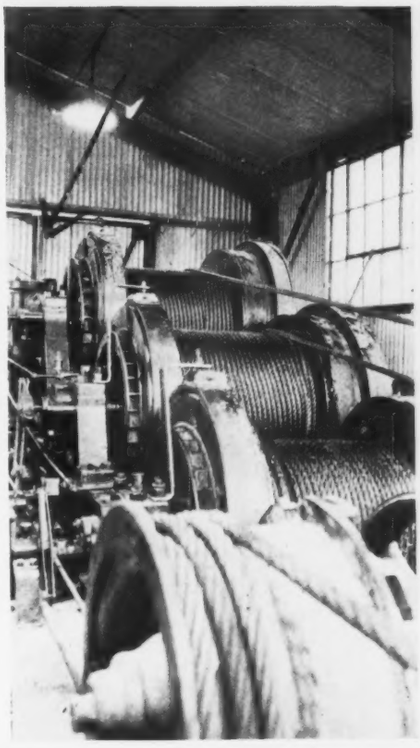
secondary crusher is driven by a 100-hp. Allis-Chalmers, slip-ring, 2200-volt, induction motor by a 16-in. belt. The longer conveyor is driven through a tandem head pulley, power being supplied by a 60-hp. motor and a Foote gear reduction unit similar to the one described on the first conveyor.



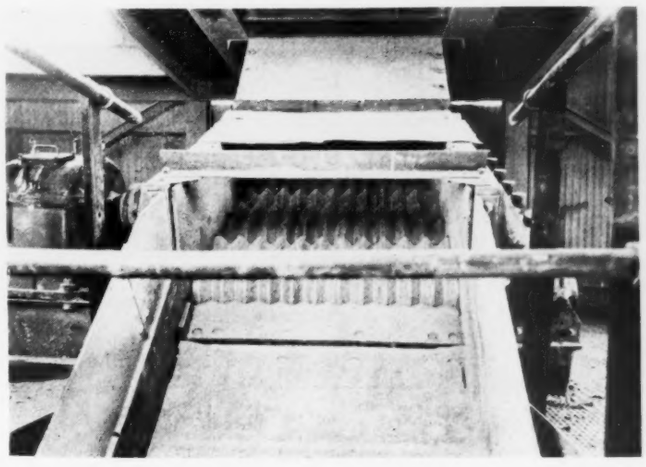
The 50-ton quarry cars dumping at the primary breaker

As the rock passes up this conveyor any large clay balls are removed by hand and thrown on to a short 18-in. belt conveyor, which discharges to a 5-yd. Western type car, and this material is discarded. Cars of similar design are used for handling the minus 1½-in. material from bins to stockpiles.

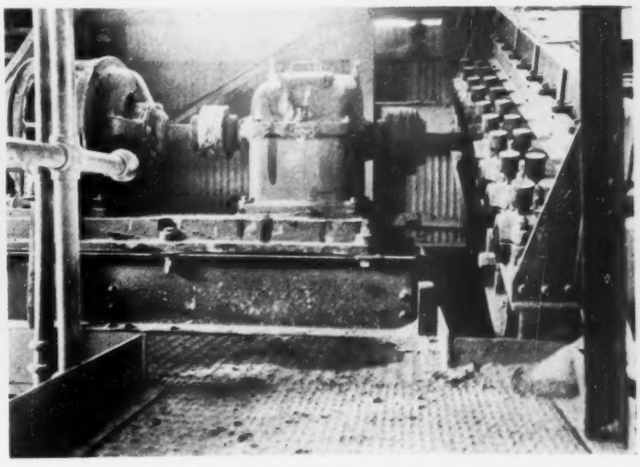
Both of the conveyors are equipped with 8-ply United States Rubber Co. "Giant" type belting; the carrier rolls are the 5-roller type of the Jeffrey Manufacturing Co., mounted on steel channels, and are lubricated with Alemite fittings, all the greasing being done on one side of the conveyor. Two ⅛-in. pipes, one reaching to a point near the center of the carrier rolls and the second pipe to the outboard bearings, carry the lubricants from the Alemite nipples to the bearings. The carrier rolls are spaced on 4-ft. centers and the flat return rolls on 12-ft. The head and tail pulleys are all 4 ft. in diameter and are equipped with Jeffrey revolving brush belt cleaners on the return side near the head pulleys. This conveyor operates at 300 lineal ft. per min. The primary conveyor operates at 300 ft. per min. also.



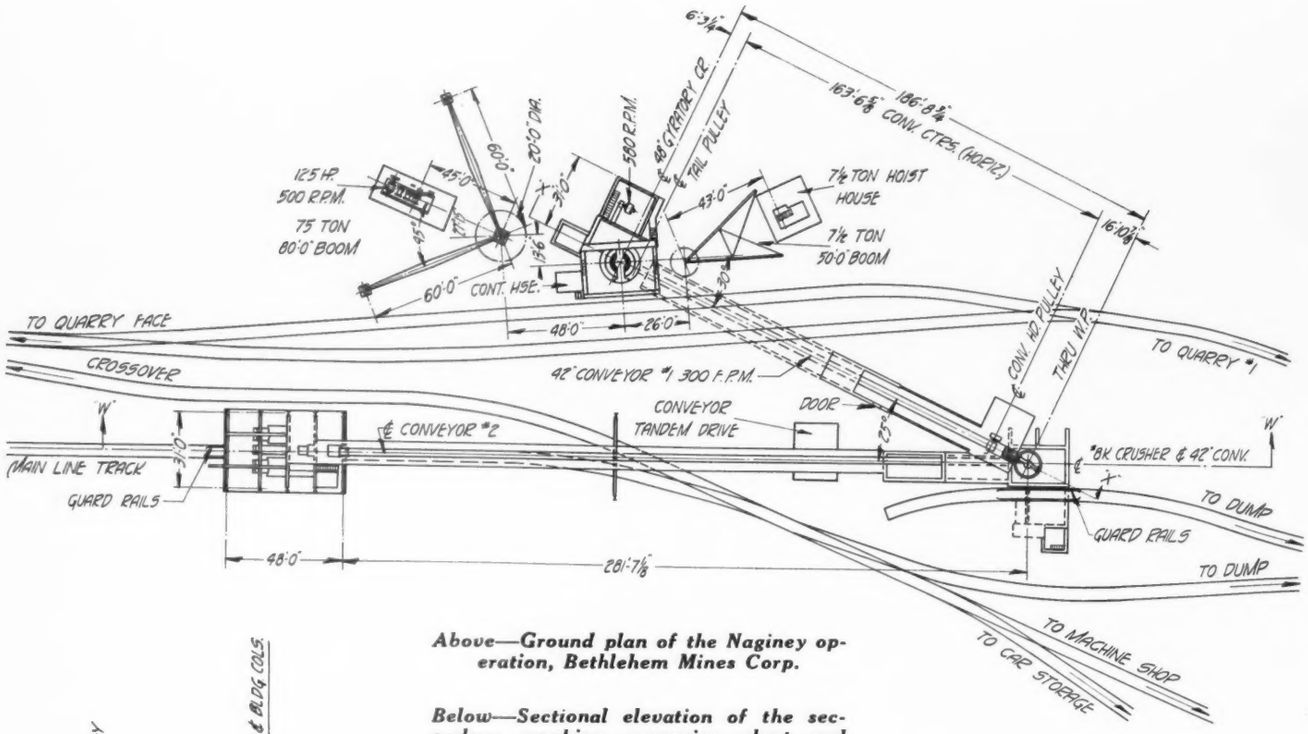
Hoist for dumping cars at the crusher



Roll grizzly takes out fines from the flux stone

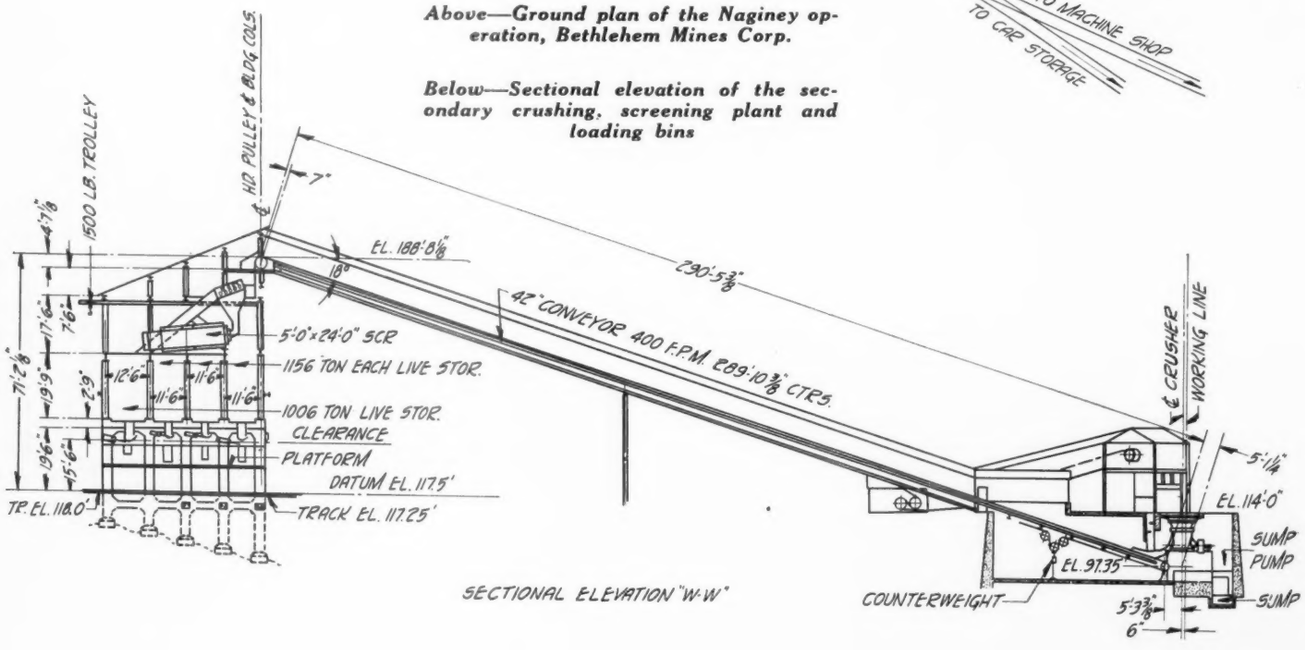


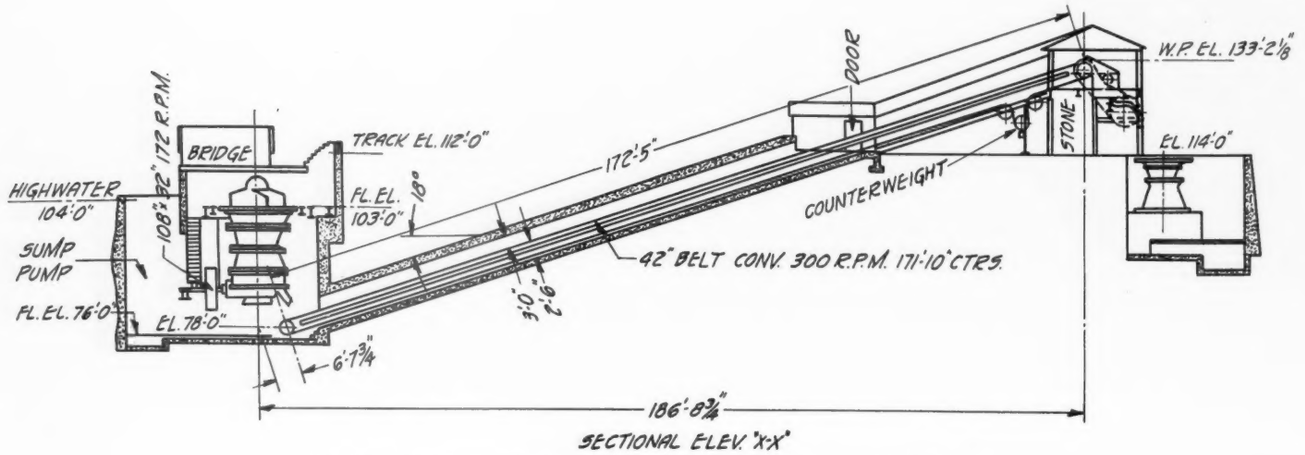
Motor and drive of the roll grizzly



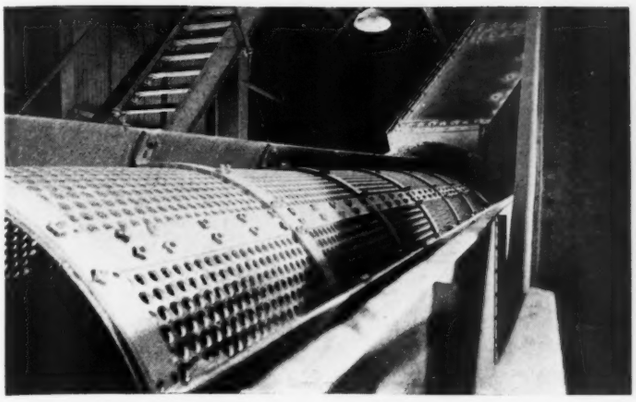
Above—Ground plan of the Naginey operation, Bethlehem Mines Corp.

Below—Sectional elevation of the secondary crushing, screening plant and loading bins

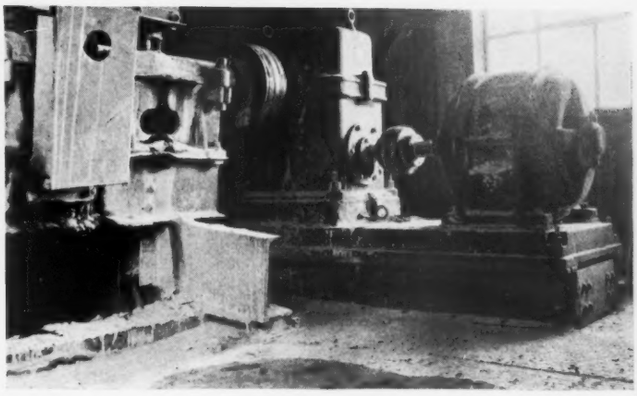




Sectional elevation of the primary and secondary crushing plants



One of the rotary screens for rescreening the "throughs" of the roll grizzly

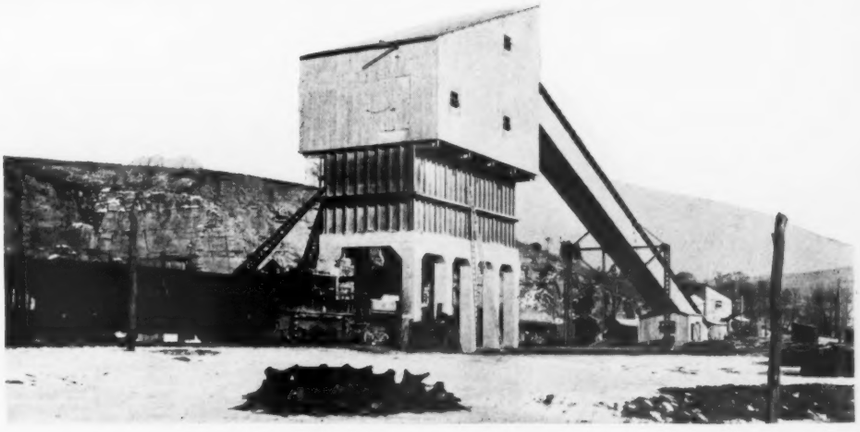


The rotary screen drive—a 30-hp. motor and right-angled speed reducer

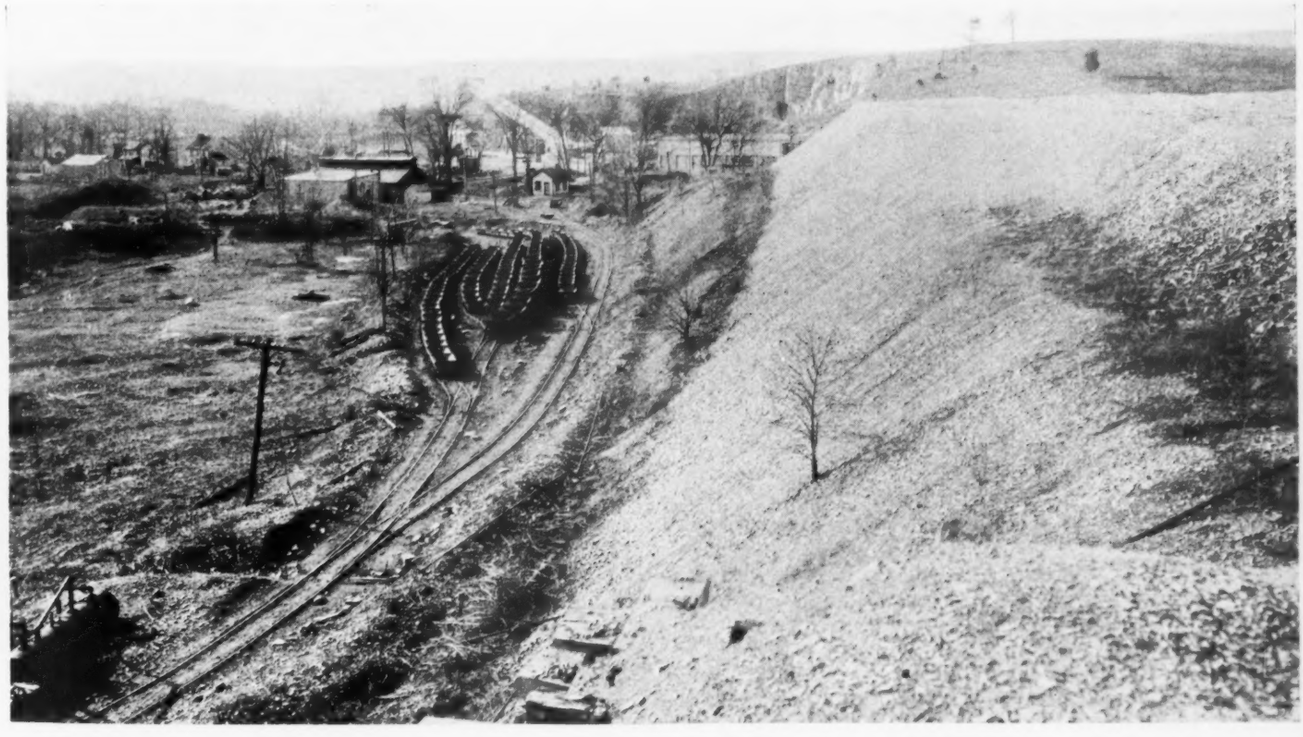
Sizing and Storage

The conveyor from the secondary crusher discharges to a 9-roll Robins "Cataract" grizzly set to 2¾-in. openings. This grizzly is driven at present by a much larger motor than is necessary, a 50-hp. unit being in use whereas a 15-hp. motor is ample. The larger motor is only a temporary convenience and will be replaced later. The motor operates at 900 r.p.m. and drives the grizzly's "Cataract" rolls at 50 r.p.m. by means of a 17.8:1, type 120-H, Foote gear reducer. The rock as it falls to the "Cataract" is prevented from unnecessary splash and spillage by several short lengths of steel rails, free swinging and suspended vertically.

The oversize from the Robins grizzly is chuted through steel chutes to proper bins, the stream of fines splitting and passing to

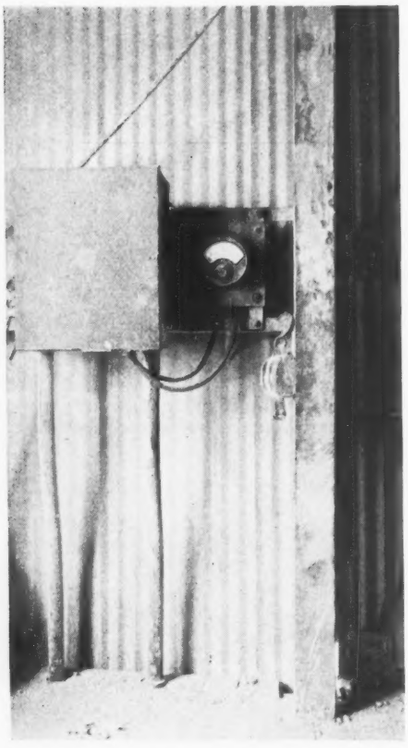


Screening and loading plant for flux stone. The new commercial stone plant is to be built close by



One of the large storage piles of finer sizes of stone (1 1/2-in. down) which will be drawn on for processing in the future commercial stone plant

The new storage dump for the fines from flux stone production. The small stone will be reclaimed shortly for commercial stone



Each motor is equipped with an indicating ammeter

two Allis-Chalmers 60-in. by 24-ft. rotary screens inclined at 1¼ in. per lineral ft. and operating at 12 r.p.m. These screens are equipped with 1½-in. round perforations their entire length and are each driven by 220-volt, 30-hp., 900-r.p.m., General Electric motors through right-angled, type HG (21.5:1) Foote reduction units.

The oversize from these screens joins the oversize from the Robins roll grizzly, as only one product is made. The fines fall to separate bins and are stockpiled at present, this material being the future source of commercial stone.

Lighted for Night Operation

The plant has a capacity of 2500 tons per 10 hours, and can be operated 24 hours, as the quarry, plant grounds and plant are amply illuminated by flood and incandescent lights.

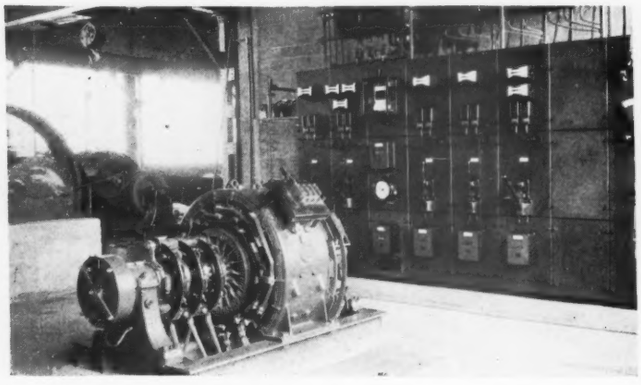
One unusual feature of this plant is that all the motors are equipped with indicating ammeters at the point of use and any excess power requirements or motor overloads can be instantly detected by the operator in charge.

The entire plant and other buildings are constructed of steel with corrugated roof and sides, and is a model of neatness and shows the result of careful and experienced engineering ability. The entire plant was designed by the company's engineers under the direction of W. S. Bourlier, chief engineer of mines of the Bethlehem Mines Corp., and erected by the steel construction department of that company.

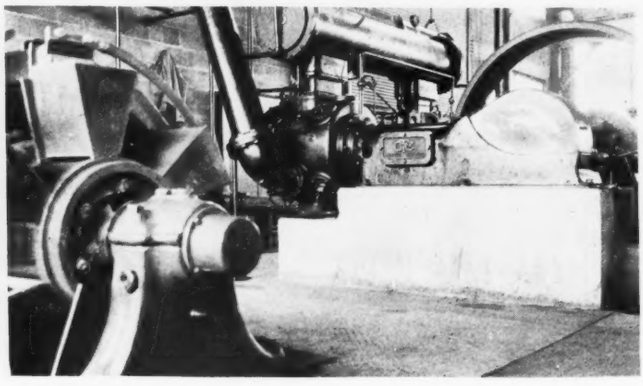
Machine Shop

A large repair shop is provided and contains a rather unusual amount of mechanical equipment, among which might be mentioned: a Leyner drill sharpener, Leyner shank and bit punch, Gill churn drill bit sharpener, trip hammers, drill presses, two large lathes, electric and oxy-acetylene welders, band saws, rip saws, shapers, planers, milling machine, radial drill press, etc. A 10-ton Northern Engineering Works electric crane spans the shop.

Hand sorted clay balls are passed to a conveyor loading the waste cars



The d. c. generator supplying current for the electric haulage system



Air compressor unit installed in a corner of the machine shop building

Alongside the shop and really a part of the same building are the company's offices, wash rooms, toilets and shower baths of ultra-modern design, large and commodious warehouse with steel boltracks and a large, neatly arranged supply of necessary spare parts.

In the rear of this building is also located a general Electric switchboard for controlling the various departments, the direct-current, synchronous converter for the electric trolley transportation system and the air compressor. The converter is a General Electric, type HCC, form P, 1200-r.p.m., 600-volt, and has a nominal amperage of 500 amps. The compressor is a Chicago Pneumatic, 17x10x12, OCB, 805 cu. ft. per min., and is driven by a 100-hp., 220-volt, 675-r.p.m., Allis-Chalmers motor through a short center belt drive, and delivers air to a 4x12-ft. receiver at 100-lb. pressure.

The machine shop, which also houses the plant offices

Safety Work

One of the interesting phases of this company's operation is its method of educating the workmen along the lines of safety, and one of its recent efforts has been the compiling of a safety code or rules, and employes are warned that they must be guarded by these rules, any violations being subject to discharge.

The safety code has been printed in the form of an 8-page folder with the rules covering the different departments segregated. These instructions are given to all the employes who, after having read them or, if unable to read, has had them explained properly, sign a statement indicating that they have read and understand the meaning of the safety code. This signed statement is appended to the code and after signing is filed in the office of the company.

A well drill sharpener is a part of the shop equipment

Personnel

The executive officers of the Bethlehem Mines Corp. are: C. A. Buck, president, and M. L. Jacobs, manager of quarries, with headquarters at Bethlehem, Penn. The operating officials are: E. R. Wash, superintendent; M. H. Simmons, assistant superintendent; J. D. Rager, general foreman, and A. L. Leidich, chief clerk.

SAFETY CODE GOVERNING DEPARTMENT OPERATIONS

BETHLEHEM MINES CORP

Employes must be guided by these Rules in all Department Operations. Any Employe violating any Rule under this Safety Code is subject to discharge.

A. FOREMEN

1. Learn all the safety rules and see that they are obeyed.
2. Teach the new man his duties and point out the dangers and hazards of his work.
3. Check up daily to see that the men are doing their work in a safe manner.
4. At all times keep the department clean and the buildings well lighted.
5. See that each man is provided with goggles and wears the same properly when working in places where his eyes need protection from flying particles of stone, cinders, irons, etc.
6. Send all injured or sick men to the office. Do not fail to have an accident report or sickness report made up, stating all details of the accident clearly. Give your personal attention to this matter.
7. Foremen are especially charged with the regular inspection of all chains, cables, and slings to see that they are in proper condition and of sufficient size and strength to do the work required of them. Any that are found defective must be replaced immediately. A daily inspection of the hoist cable, used on quarry cars, must be made by the foreman in charge of this department.
8. A regular monthly inspection must be made of all fire extinguishers to see that they are in proper condition.

B. DRILLING

1. Due to our working conditions, it is necessary at times to move the well drills on cribbing. The work of building these cribbings must be done with great care.
2. The foundation ties must rest on a smooth solid foundation and the upper ties bound in to form a substantial cribbing to carry the well drill.
3. All ties showing wear and age should be replaced by new railroad ties.
4. A platform for the driller of not less than 2½-in. plank must be built on each and every set up.
5. All protruding nails, spikes, etc., must be removed from cribbing and platforms.
6. On all cribbing built during the winter months, the ties must be nailed to prevent slipping.
7. The keys on all derrick bolts must be in place before the drill is started.
8. Electric cable must be inspected and repaired at regular weekly intervals.
9. It is prohibited to plug in lines supplying well drills without first disconnecting switch at the pole of the feeder line.

BLASTING! ALL EXPLOSIVES ARE DANGEROUS!! HANDLE WITH CARE!!!

Primary

1. All powder boxes must be opened on the stripping bank with wooden wedges and wooden mallets. All box lids should be piled with point of nail downward.
2. All matches must be removed from the clothing of all employes engaged in the handling of explosives during the loading of a primary blast. ***Absolutely no smoking will be allowed!***
3. Before the loaders leave a well drill hole, at least one box of tamping must cover the charge to prevent foreign matter from falling directly on the charge.
4. As soon as hole is loaded a box of loam or sand must be spread around collar of hole.
5. All tamping must be done with wooden tamping bars or sticks.
6. Lead or babbitt sinkers must be used on measuring tapes.
7. No funnels, other than copper, will be allowed in loading.
8. On all battery shots, the two ends of lead wire must be connected together until they are connected to the battery.
9. Powder dumped at drill holes must be protected from the cable used to bail the holes.

10. All electric cables must be removed from the loading area before starting to load the shot.
11. All materials must be removed from the line of shot before the shot is connected up with cordeau.
12. Powder must be stored in the position as directed on the boxes.
13. An open car of powder must never be shifted. Doors must be closed before locomotive couples to car.
14. All paper from powder boxes must be thrown over bank as soon as box is emptied.
15. Blast hole loading must not be done while men are working in front of quarry face.
16. Care must be exercised to make sure that cordeau fuse is in continuous piece.

BLASTING! ALL POWDERS ARE DANGEROUS!! HANDLE WITH CARE AT ALL TIMES!!!

Secondary

1. All powder boxes must be opened with wooden wedges and wooden mallets.
2. No more than one day's supply of powder is allowed to be stored in the quarry.
3. Powder, caps, and matches must be kept in separate compartments at the distance of 10 ft. required by the State Code.
4. The capping of the fuse can be done at the fuse house, but the placing of the capped fuse in the powder must be done at the working face. Fuse and caps must be removed from powder before same is returned to storage.
5. Wooden, brass or copper punches must be used for capping powder.
6. The cap must be fastened to the fuse with the crimper.
7. Fuses must not be coiled on the rocks but should lay straight to prevent crossing.
8. Fuse must be cut to standard lengths, a minimum of 3 ft. 6 in. Long fuses cut for special work must be kept separately.
9. A period of not less than 3 minutes day shift and not less than 5 minutes night shift must elapse between the time of blowing the top whistle and the lighting of any fuse. The signal from the place the shot is made should be given to the hook-up man, who in turn will ***blow off*** on plant whistle. The flagmen must hurry to their posts as soon as the warning signal is given. All traffic on the highway must be held up at once, and not released until the ***blow off*** signal is given. (Hanover quarry.)
10. All employes working west of the state highway must get under proper cover when the whistle is blown for a blast at the Steacy and Wilton quarry. (Hanover quarry.)
11. When shooting seams or holes on the bank electric exploders must be used.
12. A suitable fuse carrier must be provided and used by anyone transporting fuse and caps.

STRIPPING

1. All employes, excepting the operator, must keep off the dragline while same is in operation.
2. The boom and bucket on dragline must not swing over men working in the stripping pit.
3. The electric cable must be inspected and repaired by the foreman in charge at weekly intervals.
4. It is prohibited to plug in the electric line supplying the dragline, without first disconnecting switch at the pole of the feeder line.
5. If at any time, wire defection is found on the dragline, the switch must be thrown off, examination made, and condition corrected before machine is started running.
6. The cable holding boom must be clamped at all times, except when raising or lowering the boom.
7. In cleaning the stripping cars, employes shall at all times keep clear of the doors. Safety hooks shall be used on all stripping cars. A car must not be cleaned by hand, unless it is protected from closing when air is released.
8. Care shall be exercised by the locomotive engineer in running over tracks at the quarry and stripping banks.

QUARRY PIT

1. The shovel must not be moved before all employes are cleared from the direction of travel.
2. In cold weather, the running board of shovel must be kept cleared of ice and snow.
3. When the shovel is loading, men must stand at a distance of at least 20 ft. from the car.
4. The cart driver in passing through the tunnel to the shovel must follow directly after the empty train, and when returning must follow directly after the loaded train. In case of long delays at the shovel he must be assured that the tunnel will be clear for the length of time necessary to make the trip. (Hanover quarry.)
5. The quarry locomotives must stay on the loaded track at the foot of incline until their train of empties is completed.
6. Hook-up must cross tracks to get into position for unhooking cable as soon as the empty car leaves the crusher building.
7. Cable must not be attached to loaded cars while they are in motion.
8. Hook-up must use cutting chain or block of wood to uncouple cars. He shall not give the signal to hoist until he is out from between the cars.
9. Hook-up must inspect cable eye and pin constantly and report any defect at once to his foreman.
10. Hook-up must keep the incline switch free from stone and in working order at all times.
11. Runaway cars is the greatest danger to the men working at the foot of incline. TREAT ALL ASCENDING AND DESCENDING CARS AS A CONSTANT HAZARD.

PLANT

1. All machinery in motion is dangerous. Loose gloves and clothing are easily caught. Stop machine to adjust or repair.
2. No machinery shall be oiled or greased while in motion.
3. All guards must be in place before starting any machine.
4. No machine unit shall be set in motion, except by the operator in charge or in his presence.
5. Where blasting stone in the crusher is necessary mud capping is forbidden. A small hole must be drilled and a very small amount of powder used. All men must be in a safe place and ample warning given before shot is fired.
6. No employe shall enter the crusher hopper while the crusher is in motion unless he is wearing a safety belt.
7. When it is necessary to place a chain on a rock or to sledge off the corners, the crusher must be shut down during this period, unless proper safety belts can be used.
8. Riding the conveyor belt is absolutely prohibited. Any employe found guilty will be discharged at once.
9. When the hoist has been idle for any period, the brakes must be tested before starting to hoist cars.

LOADING RAILROAD CARS AT BINS

1. As soon as empty cars are placed on the siding by the railway company the hand brakes must be tightened on every third car.
2. Cars shall not be brought across the state highway until the watchman is in a position to flag the traffic on the road. He must use a red flag by day and a red lantern by night.
3. Car loaders are forbidden to ride on the train of cars while the railroad company is making a shift.
4. All cars must be run below the first frog on No. 1 track before a stone truck is allowed under the bins.

TRANSPORTATION

1. Before moving a locomotive the engineer must look in the direction in which the train is going and must ring the bell or blow the whistle as a warning.
2. The engineer shall not move his locomotive on any signal until he knows the position of his brakeman.
3. Flying switches will not be tolerated.
4. When crossing the highway with locomotives, cars, etc., a watchman must precede each movement across same. The engineer shall not move over the highway at any time until signalled from the highway by watchman, brakeman or fireman, that the road is clear.
5. While stocking stone, when the car is ahead of the locomotive on a down grade, the car must be either hooked or chained to the engine.
6. Switch at sand stock track must always be set to permit cars to enter that track. (Hanover quarry.)
7. Brakemen must ride inside locomotive and not on running boards.

CRANES

1. Operator must obey signals given by person in charge or the man assigned to that duty.
2. The boom, bucket or load on crane must not swing over men working in pit, track, etc.
3. The crane must be clamped to the rails with outriggers drawn while operating.
4. While working on a grade, the operator shall not attempt to shift railroad cars.

SHOP

1. All employes engaged in grinding, chipping, burning or other work where there is danger of chips or flying sparks entering the eye must wear goggles.
2. On oil cutting machine tools, as milling and pipe threading machines, drill presses, etc., the operator must use the brushes provided for removal of chips, turnings, etc. Don't use your fingers!
3. Shop tools must be used by shop men only.
4. The shop bridge crane must be oiled weekly. All trolley parts as gears, keys and bolts must be inspected and repairs made at this time.
5. All ropes, chains and cables must be inspected for defects and corrections made before lifting capacity loads. ***All employes must keep free at all times from loads lifted by the bridge crane.***
6. Band and circular saws must be inspected and corrections made before using.
7. The operator on a "circular up saw" must not stand in front of line of travel of the saw. He must stand at the side of the lumber he is feeding.
8. All used lumber must be completely stripped of nails, screws, and metal parts, before any attempt is made to take a saw cut.
9. In shifting cars into or out of the shop, only one car can be shifted at a time.
10. While working on the switch board or equivalent adjacent to charged equipment, the workman must have a helper. A thorough test must be made to determine if the current has positively been disconnected. ***The electrician or mechanic must be assured that the electric lines are clear before throwing in a switch on the board.***
11. Locks must be provided and switches locked when men are working on lines.

GENERAL

1. Employes are forbidden to take short cuts over dangerous places.
2. Employes must cross the state highway cautiously. At each and every crossing look to right and left for highway traffic.
3. Employes are warned not to deface, mark or destroy any buildings, machinery, bulletin boards or other equipment under penalty of dismissal.
4. Good conduct is expected—horse play or fooling will not be tolerated. Never fool with compressed air or electricity.
5. Employes must be careful in placing tools or materials at places where they might fall.
6. All hand tools, jacks, etc., must be kept in good repair, and in a safe condition.

Design of Sand and Gravel Washing and Screening Plants

Part III—Transporting and Elevating

By Frank M. Welch
Chief Engineer, American Aggregates Corp., Greenville, Ohio

PART I of this series covering some of the fundamentals of the industry was published in the April 27 issue and Part II on plant design and stripping and excavation methods in the June 8 issue.

Transporting

The method of transporting sand and gravel from the excavating unit in the pit to the washing plant is first governed by the type of excavator used. Where the material is pumped, the most economical transportation is through pipe lines carried on pontoons to the shore at a point adjacent to the plant. We find that steel constructed pontoons are the best in the long run. We also find that as the dredge gets further from shore it is well to confine the rubber sleeves, used as pipe couplings for flexibility, to a few of the joints adjacent to the boat and to the shore end of the pipe line. By omitting the flexible joints between the first few lengths of pipe at either end, friction is reduced, thereby decreasing the power required and increasing capacity.

When the pump boat eventually digs its way to a point so far from shore that the friction of the long pipe line makes the cost of the pontoon system prohibitive, or in river operations where the dredging unit is never within pumping range of the plant, then barges are resorted to. Steel, wood, and even concrete barges are in use for this purpose. The greatest variation in the barge operation, however, is the methods used in unloading them. The largest percentage of them, without question, is unloaded with a clamshell. Some very efficient designs, known as drop-bottom barges, are in use, where doors or gates in the bottom are tripped near shore and the entire cargo is dropped into the bottom of the lake. Of course, with such units a dragline, clamshell or other excavating means must be used for reclaiming and feeding the plant. The advantages in these equipments lie in the fact that so little time is required to unload them that fewer barges are needed.

A recent development has occurred where the suction dredge worked its way so far from the plant that the excessive head caused by the long discharge pipe line reduced the capacity to a prohibitive point. The problem was solved by pumping into a field hopper on shore near the dredge, from which cars hauled the material to the plant.

There are several barge designs in use where a belt conveyor is installed in a sort of tunnel in the bottom of the craft, underneath the hopper which carries the sand and gravel. These conveyors discharge the material into hoppers on the shore. Theoretically they are quite efficient, but in practice the spillage is so excessive on account of the abundance of water flowing from the hoppers on to the belt when the gates are opened, that the harbor fills up quickly and has to be dredged out every few days.

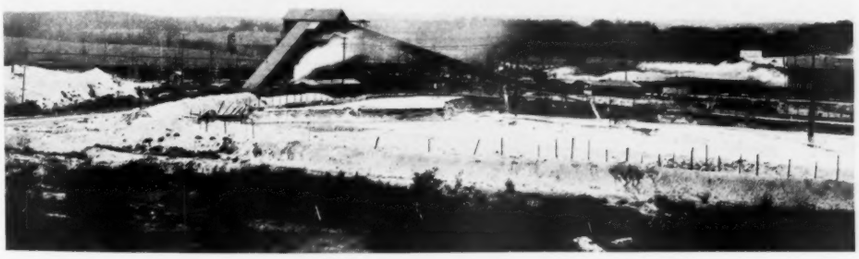
On the Great Lakes where sand and gravel are pumped several miles from the unloading docks, the pumping equipment is mounted on great boats, which hold 200 to 600 tons of material. Often these boats pump in the day time and are unloaded by the night shift or vice versa. They are mostly unloaded by clamshells. I had the privilege of visting a very unique and efficient lake unit a few months ago, where the unloading was accomplished by means of a bottomless drag mounted on the boat. This boat also contained a very clever dewatering system, whereby two long rows of settling tanks on deck disposed of all excess water before discharging the material into the boat hopper.

Typical elevator made up of heavy steel buckets mounted on two strands of steel thimble roller chain

Where ladder dredges or any of the other than pumping methods are mounted on boats, the accepted method of transportation is the barge.

Track Hauling

Where steam or electric shovels or revolving draglines compose the excavating units, trains of side or bottom dump cars, hauled by steam or gasoline locomotives, are in very common use for transporting raw material to the washing plant. Side dump cars are probably in the most common use. By elevating the rails properly near the dump hopper, these cars can be made to dump and right themselves automatically. The bottom dump cars are



The No. 1 Brighton, Mich., plant of the American Aggregates Corp. Two belt conveyors carry excavated material from deposits on both sides of the railroad. Capacity is 160 cars in 10 hrs.

usually built to hold as much as several of the small side dump cars, thereby saving time in loading and unloading. Several of the larger operators have been adopting the larger cars recently, although the heavier equipment necessitates considerable more maintenance expense on the pit tracks.

A great deal of time can be saved at the excavating unit if a large field hopper is installed. This hopper permits the shovel to work continuously and allows the trains to load in much less time. On the other hand, unless the shovel has a high lift, the field hopper is not practical. Smaller operators have found the field conveyor method of transportation quite satisfactory. I think however that as many of these have been discarded as are in use. They are fed by small traveling field hoppers which follow the shovel and they furnish a rather uniform continuous flow of material to the plant. They eliminate considerable labor and avoid the necessity of a receiving hopper at the foot of the plant conveyor. Their disadvantages however lie in the fact that they must be moved so often. They must be made up in sections for convenient portability and unless much time and care are used in moving and resetting them, they are continually getting out of alignment.

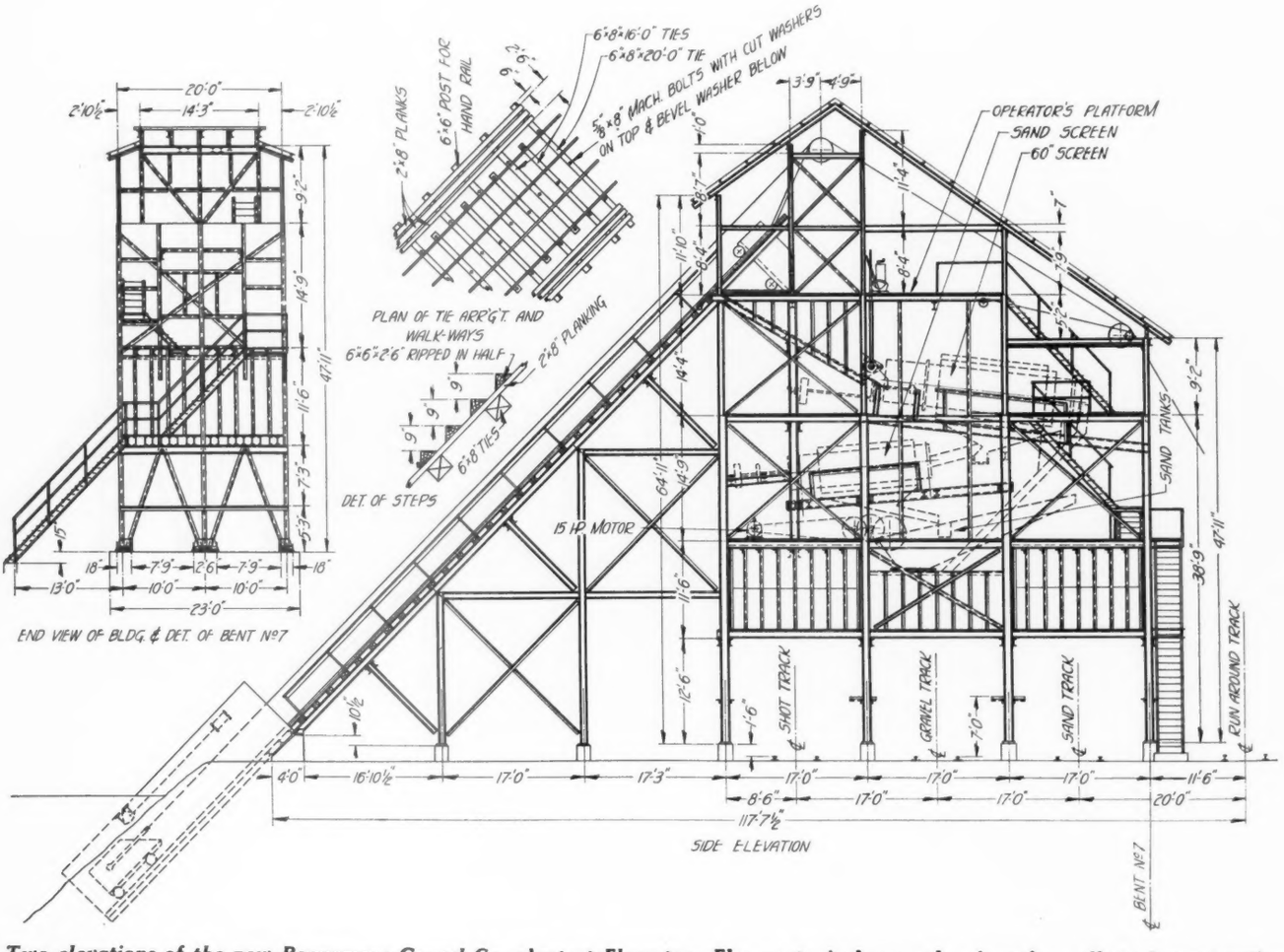
As stated previously under the discussion of excavating, the cableway excavator and the bottomless drag usually do their own transporting of material to the washing plant. There are plants however, where the excavated area has outgrown the radius of the cableway, and some of the various methods described above are utilized for transporting from the outlying cableway units to the plant.

Elevating

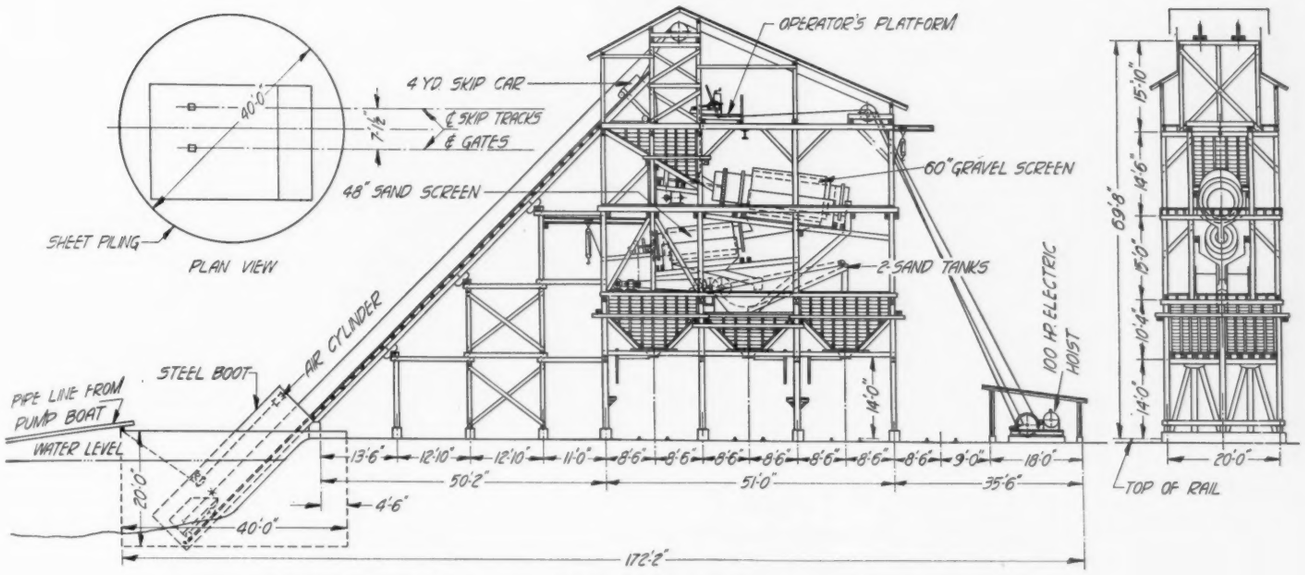
As the method of each successive handling of sand and gravel depends to a large extent upon the type of unit used for the immediate previous conveyance, so does the most useful method of elevating the raw material to the top of the washing plant depend greatly upon the mode of transportation from the excavating unit. The most dependable elevating unit is also governed considerably by the wet or dry condition of the material to be handled.

When dry material is received at the plant from dump cars, field conveyors, or from a clamshell, the belt conveyor is the elevating unit most universally used. There is no type of conveying or elevating unit quite so satisfactory or economical as the belt conveyor, providing the material is dry or nearly dry and is free from boulders too large for practical handling on such a unit. On some small operations, where ground space is possibly limited, bucket elevators are used for the main elevating unit. Bucket elevators for various reasons, have been trouble makers and cause for frequent delays. The nature of the construction of the bucket elevator —it being composed of many parts—lends itself readily to frequent breakage. In justice to this unit however, I want to say that from the mechanical standpoint, the bucket elevator has been greatly abused. I mean by this that probably out of every ten in use, nine have been improperly or inadequately designed for the purpose intended. In our own operations we use a type of bucket elevator, suitably designed for re-elevating stone from our crushers, which requires as little maintenance as any unit in our plants. Although these units have gained rather universal disrepute on account of careless engineering, and though they are quite suited for re-elevating, they are not considered the best equipment for the initial elevating unit.

Where the material is pumped and transported to shore through pipe lines,



Two elevations of the new Roquemore Gravel Co. plant at Flomaton, Fla.—a typical example of modern all-steel construction



Typical 50-car plant using skip-hoist for elevating pumped sand and gravel

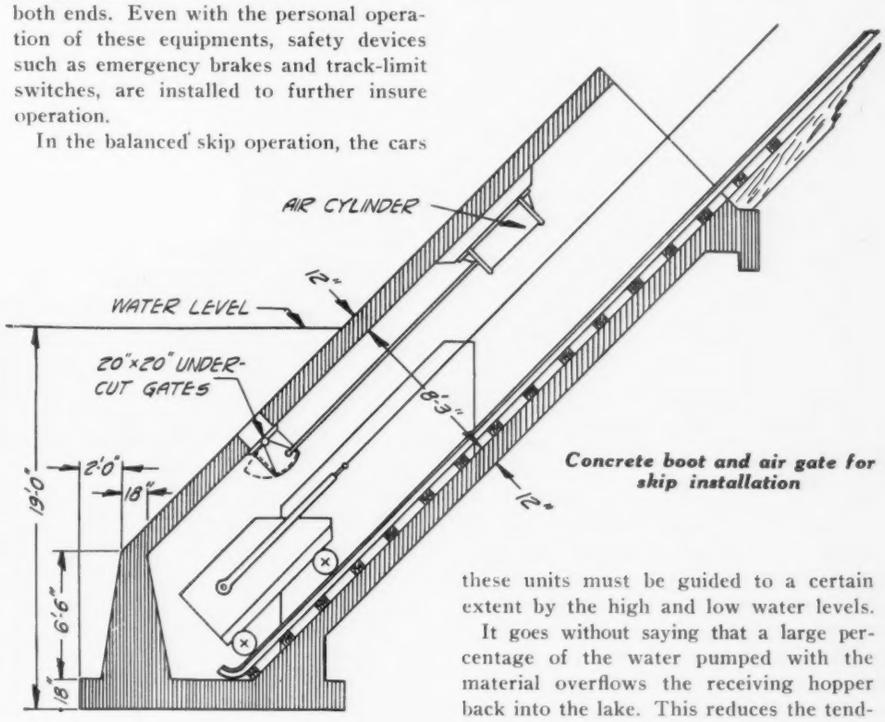
the only satisfactory method of elevating to the top of the washing plant is the balanced skip hoist. Only in very small operations, is it considered advisable to pump material all the way to the top of the plant. The fact that the weight of the water so far exceeds the solids in the pumping operation causes so much additional power for every foot lifted above the lake level that in plants of any size the cost of pumping to the top is prohibitive.

Skip Hoists

The skip hoist equipment, which has been adapted to gravel plant use in comparatively recent years, has actually exceeded expectations in its efficiency, and constancy of operation. The maintenance on the skip unit is little or nothing and it is always ready to go. It handles wet material as readily as dry, boulders as readily as sand, and the fact that one car balances the other permits all the power to be utilized in lifting actual material. Several plant managers have gone so far as to state that regardless of whether wet or dry material is to be handled, they would as soon elevate their material with a skip hoist as with a belt conveyor.

It is true that a motor twice the size of that required to lift an equal amount of material with a belt conveyor is needed to operate the skip hoist, but when it is considered that this motor operates only about 15 seconds out of every minute, the actual power consumption is really less. It is further true that a man is used at the top of the incline for operating the hoist and another man at the bottom for filling the cars, whereas the substitution of a belt conveyor would eliminate one or both of these men. The expense of these men is equalled however in the conveyor installation by the maintenance and belt renewals required. The possibility of eliminating one or both of the men used in operating the skips by automatic control has been weighed and discussed and may be in use at some operations, but the verdict of most large operators is that the importance of the unit and the quantity of material being handled justifies the personal attention of competent men at both ends. Even with the personal operation of these equipments, safety devices such as emergency brakes and track-limit switches, are installed to further insure operation.

In the balanced skip operation, the cars are alternately let down into a steel or concrete tunnel underneath the receiving hopper into which the material is being pumped. The lower this tunnel and hopper are installed in comparison to the water level in the lake or river, the lower the discharge from the pontoon lines can be, thereby reducing the head against the main pump on the dredge boat. Most installations locate this tunnel and hopper at such an elevation that the gates in the bottom of the hopper, which alternately feed the skip cars, are from 1 to 5 ft. below the water level. When flood conditions occur however, the location of these units must be guided to a certain extent by the high and low water levels.



Concrete boot and air gate for skip installation

It goes without saying that a large percentage of the water pumped with the material overflows the receiving hopper back into the lake. This reduces the tendency for so much water to flow through the gates although this water merely overflows the skip cars as they fill up. A 3-in. or 4-in. pump is always installed in the tunnel, which permits the man at the gates to throw a switch and dewater the tunnel whenever the water gets too deep. The receiving hopper can readily be arranged so that the overflow water

will take with it a quantity of excess sand if so desired, thereby increasing the capacity of the washing plant.

Tunnel Gates

In all except small operations, the tunnel gates are operated by compressed air. This permits gates to be used which are larger than can be rapidly handled manually, thereby reducing the car loading time to a few seconds. At the top of the incline the skip cars discharge into a hopper of sufficient size to insure a constant feed in the screen. The operator's platform at the top should be so located that he can not only see that the hopper is kept filled, but that he can also watch the feed into the screen or screens, to insure a constant and maximum flow of material through the plant. Very often this feature will eliminate a man in the screen room.

The comparative cost of the balanced skip installation against the belt conveyor is somewhat greater, but I have yet to hear the first regret at having determined on this type of elevating. In fact, many operators state that where wet material is to be handled there is no other method. There is of course the dewatering elevator.

Dewatering Elevators

The dewatering elevator is a heavy digging bucket elevator, preferably of manganese steel, similar to ladder dredge construction, inserted in the receiving hopper into which the pipe line discharges. This elevator discharges on to a belt conveyor, another bucket elevator, or carries the material itself to the top of the plant. Such a flow sheet is very simple, but the excessive cost and maintenance of such a unit and the inadequacy of the belt conveyor to handle this material which is still far from being dry, are the reasons why the dewatering elevator is not in universal use.

Where material is received at the shore on barges and unloaded by a clamshell or other method, common practice in the past has been to elevate by means of a belt conveyor or elevator unless in case of small operations, where the slow method is adopted of discharging the clam at the top of the plant. Here again we have material which is seldom dry enough to insure the best results when handled on a belt conveyor or bucket elevator, and again the balanced skip is found best fitted for the elevating equipment. Where the cableway excavator is the main excavating and conveying unit, it discharges its material, as stated heretofore, at the top of the plant and no further elevating unit is required.

Some operators are fortunate enough to find good gravel deposits high enough on a hill top and sufficiently above their loading tracks or highway to permit to a large degree a gravity operation. Such a condition will at least eliminate the necessity of a main elevating unit. I saw one such condition where the excavating was done hydraulically, using the same methods as were described under hydraulic stripping. The material was flumed to the top of the plant which was lower than the deposit, and of course a very low cost of production was the result.

Unusual Mineral Deposit Explored by Government

DURING the World War a prospector searching an old tunnel near Libby, Mont., noticed flakes of a coarse mica-like mineral that writhed and swelled enormously when touched by the flame of his candle. The flaky mineral, according to a statement just issued by the Geological Survey, Department of the Interior, proved to be vermiculite, and further examination showed it to be present in great quantities. The name vermiculite is applied to a group of minerals that expand and give off water upon heating. Some members of the group thus open into long, wormlike threads, hence the name. The heated and expanded material is very light, exhibits a golden or silvery luster, and appears to have very low heat conductivity. These properties suggest possible important commercial uses. The vermiculite deposit near Libby, Mont., which is more extensive than other known similar deposits in this country, is accompanied by asbestos and feldspar in considerable quantities and by other interesting minerals, one of which carries small percentages of vanadium, a metal that is useful as an alloy in certain types of steel. A report on this deposit, under the title "Deposits of vermiculite and other minerals in the Rainy Creek district, near Libby, Mont.," by J. T. Pardee and E. S. Larsen, has just been published by the Geological Survey as Bulletin 805B. Copies may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents.

Gravity Concentration of Fine Phosphatic Sands

AN INVESTIGATION of the beneficiation of Florida phosphate ores has been in progress for some time at the Southern Experiment Station of the United States Bureau of Mines, Department of Commerce, Tuscaloosa, Ala., in cooperation with the University of Alabama. Among other methods gravity concentration has received some attention.

Table tests with a sized feed were not promising, but recent tests in which a classified feed was tabled were more satisfactory. In these tests a tube classifier was used to prepare a feed for table treatment. Though a single-tube classifier was used, the classifier fractions subsequently tabled represented approximately the first four spigots of a six-spigot classifier. The materials treated were phosphatic sands minus 20-mesh in size; the feed was obtained by screening out the plus 20-mesh material, which had an analysis above the minimum grade—68% bone phosphate of lime—from a representative sample of debris-bank sands or washer rejects. The feed analyzed 15.2% bone phosphate of lime and 78.6% insoluble. In the tests the concentrates produced analyzed 71.4% bone phosphate of lime and 5.5% insoluble and contained 33.5% of the phosphate content of the feed. Due to lack of time the fractions minus 60 and plus 100-mesh in size were not treated. It is estimated that, had these fractions been classified and tabled and had table concentrates assaying 68% bone phosphate of lime been obtained, the recovery would have approximated 44% of the phosphate content of the feed.

These data for the recovery of phosphate may seem low, but only two-thirds of the phosphate grains have a specific gravity, as indicated by heavy solutions, as high as 2.95; the sand, mainly quartz, approximates 2.65 in gravity, so that the difference in gravity, upon which a separation was obtained, was about 0.3 of a unit.

Character and Properties of Bentonite

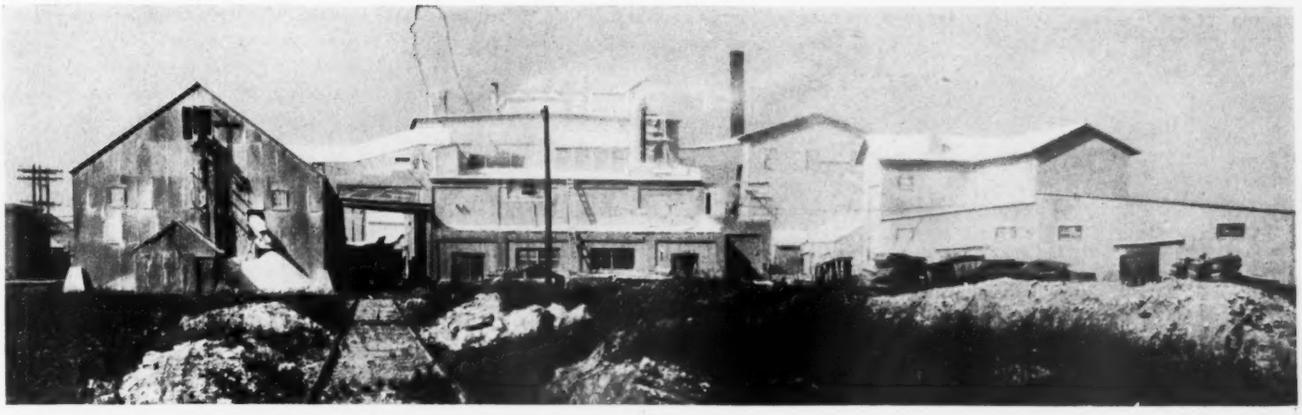
BENTONITE, a colloidal clay, occurs in several sections of the United States and is mined on a small scale. Its preparation for the market depends largely on its use in the industry. It is sufficiently scarce in sources near to market to make any new discoveries of importance. However, this clay occurs in large expanses in various parts of Canada, according to a recent report in the *Journal of the Society of Chemical Industry* (England), in which paper appears also the results of two investigations concerning the properties and application of this mineral. The findings are in abstract:

Bentonite, a colloidal clay, has been proved to consist mainly of a sodium clay, exhibiting the usual characteristics of a sodium clay such as liberation of sodium hydroxide by hydrolysis in water, impermeability to water, etc.

It has been proved a good emulsifier for certain oils, usually forming the oil-in-water type of emulsion suitable for the spraying of plants. In the case of cresylic acid it has been shown to give the dual types of emulsion.

In addition, bentonite is, to some extent, a water softener acting by base exchange, thus being useful in cases of permanent hardness.

The fault of bentonite as a practicable emulsifier and water softener is its impermeability to water.



The Winnipeg plant of the Canada Gypsum and Alabastine, Ltd., the only gypsum products operation in Manitoba

Gypsum Industry in Manitoba

Canada Gypsum and Alabastine, Ltd., Has Solved Problem of Distributing Through Many Small Dealers

By Walter B. Lenhart
Associate Editor, Rock Products

A LARGE AREA of sparingly settled country, stretching a distance of 1800 miles from Port Arthur, Ont., to Jasper, Alta., is served by the Winnipeg, Man., plant of the Canada Gypsum and Alabastine, Ltd., the only gypsum products company operating in the province of Manitoba. This company operates a quarry at Falkland, southeast of Kamloops, B. C., and gypsum products plant at New Westminster.

Part of the deposit showing the banded, irregular structure of the rock

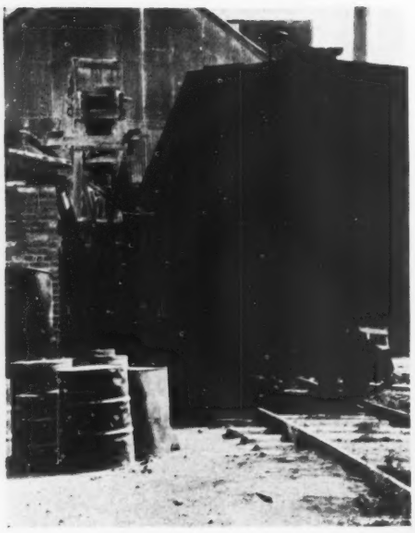
A closeup view showing the shattered quarry face

The Canada Gypsum and Alabastine, Ltd., also operates a plant in Montreal, Que. (described in ROCK PRODUCTS, October 27, 1928, issue), and a plant at Caledonia, Ont. Home offices of the company are at Paris, Ont.

The gypsum beds mined by this company are located northwest of the narrows of Lake St. Martin, immediately north and northeast of Gypsumville. The company owns 1500 acres of gypsum-bearing ground here. The village of Gypsumville is 164 miles north of Winnipeg, and is the northern terminal of the Canadian National railroad.

The gypsum beds that outcrop in this area extend in an east and west direction for 8 miles, and in a north and south direction for

Drainage tunnel connecting the lower part of the quarry with Lake Martin



Loading crude ground gypsum for cement plants

7 miles, and the outcroppings are visible in the low ridges that rise above the swampy country. The deposits will vary in thickness from 20 to 40 ft. and there is estimated to be 10,000,000 tons of gypsum exposed, or at least only partly covered by a few feet of overburden, consisting of earth and brush roots.

Other gypsum has been found by drilling at St. Arnaud, St. Elizabeth and Dominion City. These towns are 10 to 12 miles southeast of Winnipeg. At Leifur, 25 miles northeast, on a direct line from Winnipeg, and on the west central shore of Lake Manitoba, gypsum has been located, as well as at Rathwell, 20 miles southwest of Winnipeg. None of these deposits have ever been exploited, however.

Quarrying Methods

The Canada Gypsum and Alabastine, Ltd., operates two quarries, the larger part of its stone coming from a ridge that runs in a northerly direction from Gypsumville. This deposit covers a great area and was until recently worked from an average 20-ft. face. Recently a drainage tunnel was driven, connecting the lower part of the quarry with Lake St. Martin, so that the area is being drained, and this will result in a large tonnage being secured from the present quarry floor.

The areas are associated with some anhydrite, the amount increasing with depth, and east of this quarry, core drillings have revealed 100 ft. of that mineral. In a report published by the Industrial Development Board of Manitoba, Winnipeg, by R. C. Wallace, the folded, banded and shattered condition of the gypsum face or outcrop is attributed to the thrusts resulting from the hydration and subsequent expansion of the underlying anhydrite.

The rock is so sticky it will not run from the hopper-bottomed cars

The quarry operation is very simple, as the flat, low-lying deposit makes it possible for standard-gage railroad gondolas to be run directly to the face, where the shattered gypsum is loaded by a railroad type Bucyrus steam shovel with a 2 cu. yd. dipper, 14 to 15 shovelfuls being required to fill a car.

It is rather unusual, however, to find that a fast explosive is used in this quarry, a 60% gelatin dynamite. Most operations in rock of this nature use a 20% dynamite, as the slower powder best suits the needs. However, here, owing to the excessive banded and semi-shattered condition of the face, a great part of the explosive's energy is lost in the seams. Drilling is done by hand augers of the Wood type, with the spike or center of the bit removed.

This rock is mixed with a considerable amount of clay at the joints, which in this case, it is claimed, acts to increase the plasticity of the calcined material; but for the better grades of plaster the company operates a second small quarry at Elephant Hill, 6 miles north of the main operation, and hauls the rock in wagons from that quarry for delivery to the railroad. This rock is more in the nature of a fine-grained selenite. In both quarries the company employs a total of 33 men.

Owing to the severe winters, the quarry operates only from early in March to the first part of November. The plant operates

Steam shovel with 2 1/2-yd. dipper loading gypsum at the quarry

The quarry drainage ditch and tunnel

Gypsum is loaded direct to the gondola cars

Part of the quarry face. Note the teeth marks of the excavator in the gypsum bank

One of the quarry faces showing the slight amount of overburden

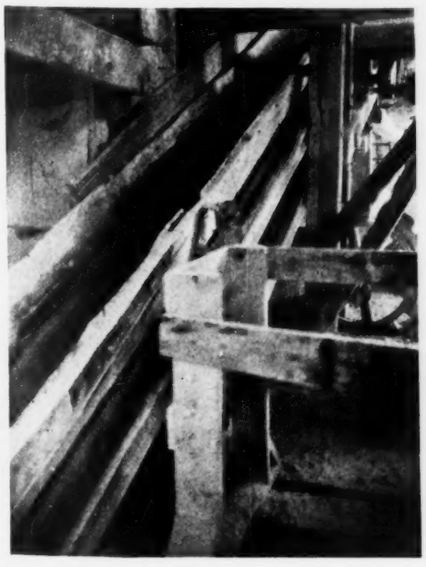
practically all the year round, but at reduced tonnages during the winter months, drawing on the storage supply for the necessary raw material.

Handling Wet Rock at Plant

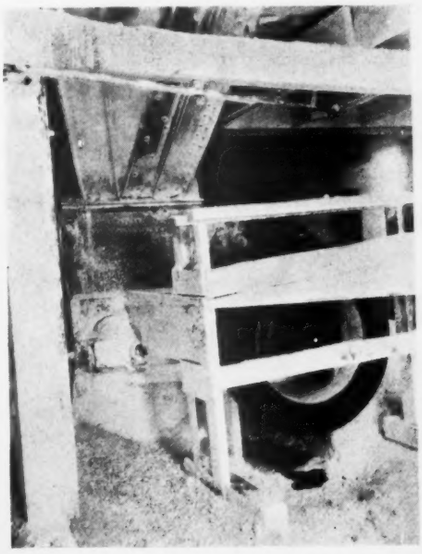
The wet rock as loaded is of slabby structure, and the pieces are not large; very few pieces would stay on a 6-in. grizzly. In that condition it is delivered to the mill, located 2 miles west of the city of Winnipeg, where the gypsum is dumped to a track hopper. Owing to the wet, sticky nature of the material, it does not flow from the hopper-bottom cars, and requires two men to keep poking the rock to get it to run out of the car.

The track hopper discharges to a 24-in. pan conveyor, inclined at 45 deg., that serves a No. 5 Williams mill, where the gypsum is crushed to minus ½-in., although this is not standardized, for the machine can be set to deliver a wide variety of products. The Williams mill is driven through a 16-in. belt by a 125-hp. Fairbanks-Morse induction motor, operating on 550 volts, 60 cycles, 3-phase, as do all the motor units in the plant. The crusher operator, from a platform above the crusher, controls the delivery of rock on the pan conveyor by starting and stopping the equipment as needed.

The minus ½-in. material discharges to a 24-in. bucket elevator and is delivered to an 18-in. pan conveyor that carries the crushed material to the drier, located across the rock delivery track and in a separate building. This pan conveyor also serves as a feeder

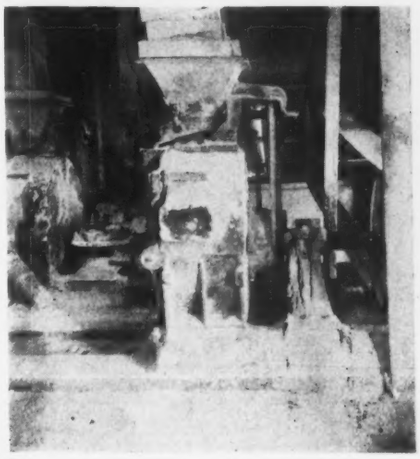


Inclined pan conveyor from the track hopper to the hammer mill



Run-of-mine gypsum is crushed initially in this hammer mill

to a ¾-in. wire-rope, disc-flight, trough-drag conveyor, that drags the gypsum to the ground storage building alongside the crusher building. The storage pile holds about 3500 tons of live material and is reclaimed by the return side of the drag conveyor. The material is fed to the reclaiming drag from the top by simply removing the loose 2-in. boards that make up the top of the reclaiming tunnel and letting the crushed material slide into the trough as needed. The material contains so much physically retained water that it packs and partially re-cements, and is removed from the stock pile with considerable

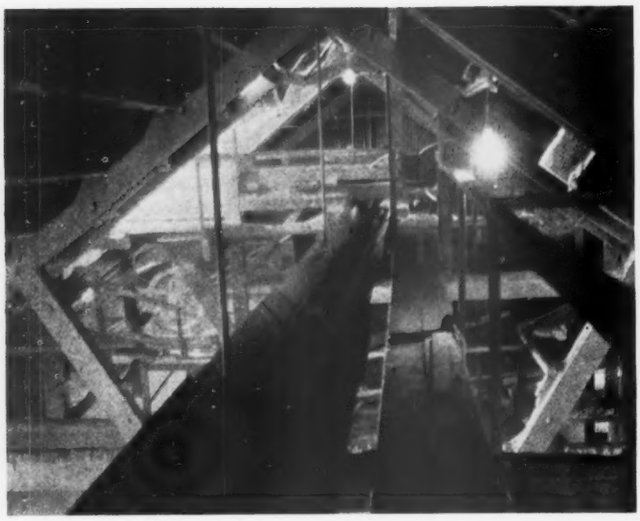


Vertical burr mill with vibrating feeder used in raw grinding

difficulty. The drag is driven by a 22-hp. Handing-Clinton and Co. electric motor through gear reduction at the head pulley.

The rock from the pan conveyor can also be passed to a short cross conveyor that

Two of the four horizontal underrunner mills for raw grinding



Drag conveyor feeding to storage piles. The return side of the conveyor reclaims material from storage

Driving end of stockpile conveyor at a point where it passes under the pile for reclaiming

delivers the material to an elevated apron for loading portland cement mill rock into box cars. The crushed gypsum is drawn from this apron into wheelbarrows for loading the ends of the car. During the season one car per day of cement rock is shipped, and loading requires two men for about three hours.

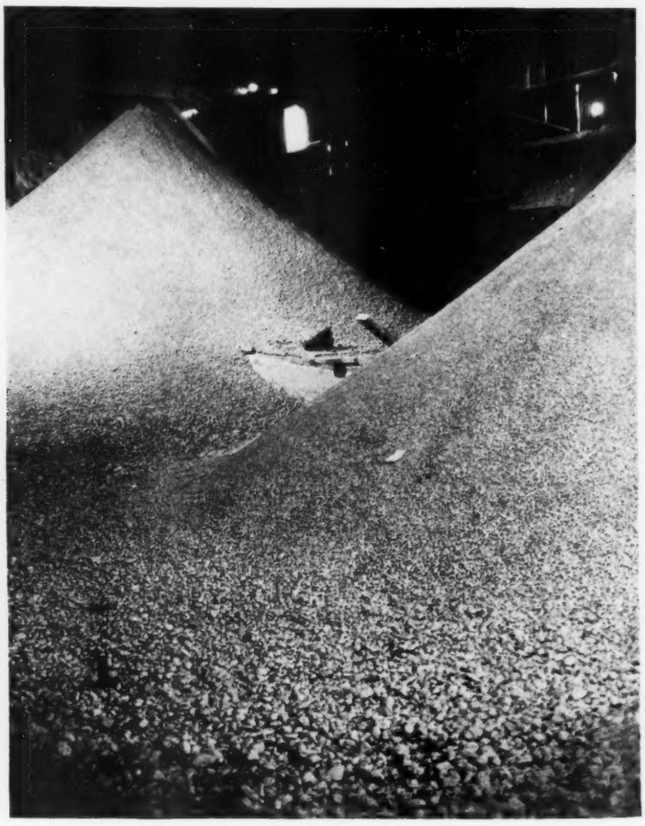
Processing

The plant was originally designed to use the Cummer process for calcination, and the rotary calciner that was used then is now in operation, acting as a drier, and receives the minus ½-in. material from the pan conveyor. This unit is 74 in. in diameter by 50 ft. long, and is fired by a stoker, using a good grade of Pennsylvania and West Virginia bituminous coal screenings and slack for fuel. Fuel of a similar kind is used under the boilers for the wallboard plant's steam supply.

The drier, its fan, the two pan conveyors, elevator, cross-belt conveyor at crusher house, as well as the necessary elevators from the drier, are all driven from suitable countershafts and jackshafts by means of a 125-hp. General Electric synchronous motor.

The dried gypsum is delivered to bins that serve four vertical type, 36-in. Sturtevant burr mills using hand-dressed American stones as the grinding media. These four mills are driven by a 150-hp. General Elec-

Overhead trough discharging crude crushed gysum to storage below



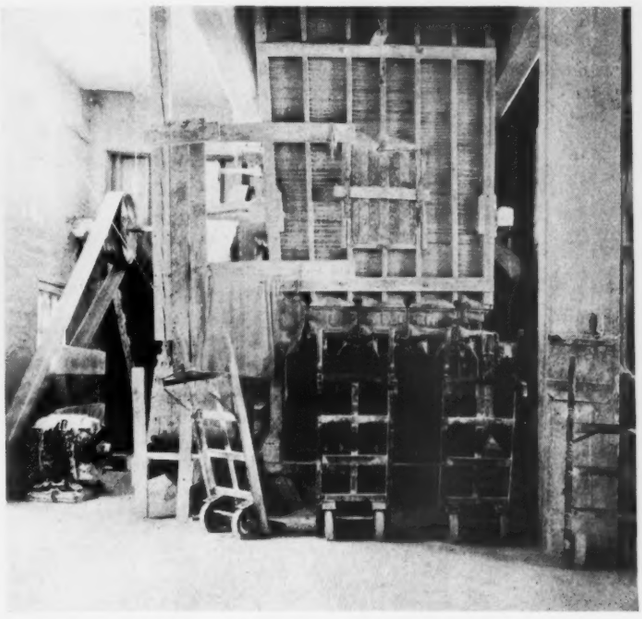
Part of the stock piles showing portion of the reclaiming tunnel

tric motor from a countershaft, and their capacity on this sized feed, grinding to a fineness of 85% minus 100-mesh, is 3 tons per hour. This is equivalent to 12 tons per 150 hp. or 12.5 hp./ton/hr. In addition, for raw grinding (no regrinding is done at this plant), there are four 48-in. horizontal Munson under-runners driven from a countershaft by a 125-hp. G. E. induction motor. The under-runners will deliver 2½ tons per hour each, which amounts to 10 tons per hour for the four mills, or 12.5 hp./ton/hr. Considering the amount of fines in the feed material and its dryness, the relatively coarse discharge, the per horsepower per ton is considerably higher than most similar operations. Ten horsepower per ton per hour *delivered to the bin* over the kettles is ordinary practice in other localities, but with other type of equipment.

By a series of screw conveyor and elevators, the ground material is delivered to the four, coal-fired, 14-ton capacity, Butterworth and Lowe kettles. The kettles are fired by one man per shift and burn 130 lb. of coal per ton of gypsum. (This figure was taken from a review of the tonnage produced and coal consumed over an extended period of time.) The kettles are discharged at around 300 deg. F., although the end of the calcining cycle is not determined by the usual temperature readings, but the kettle is dumped by the calciner when, in his judgment, the batch is sufficiently cooked. An indicating thermometer, however, is available.

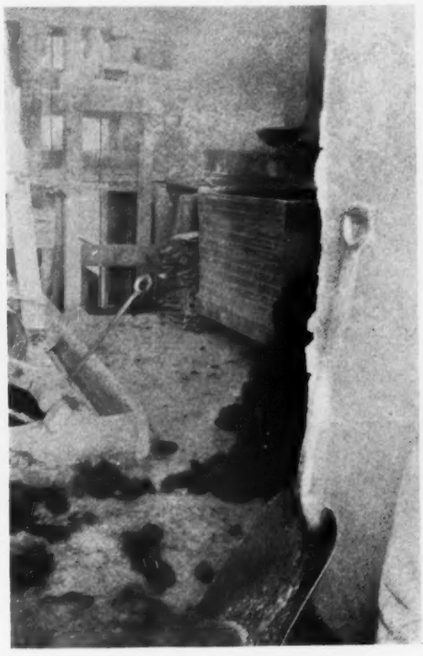
The kettles are driven by 50-hp. General Electric motors, two kettles being driven from each motor from a suitable countershaft, and each kettle is driven through a jaw type clutch. The kettles discharge to hot pits, over which the calciner's floor is built. These pits are emptied by hand to a screw conveyor and elevator. At the top of the elevator, conveyors are placed to carry the kettle discharge to the stucco bins or to bins in a separate building that supply the tile and wallboard plant.

Below — Weighing hopper and screw conveyor for sacking higher grades of plaster



Packing bins and packer for fibered hardwall plaster

There are two 1200-lb. Broughton mixers that deliver by gravity to the Bates valve-bag sackers. The hardwall plasters are sacked in a 4-tube machine, but the better grades of plaster are sacked in a separate 3-tube packer. The mixers, spill elevators and freight elevators are driven from a countershaft by a 75-hp. Allis-Chalmers motor. The 4-tube packer is driven by a 30-hp. Westinghouse motor, and a 15-hp. G. E. motor serves the 3-tube machine.



Plaster mixing floor

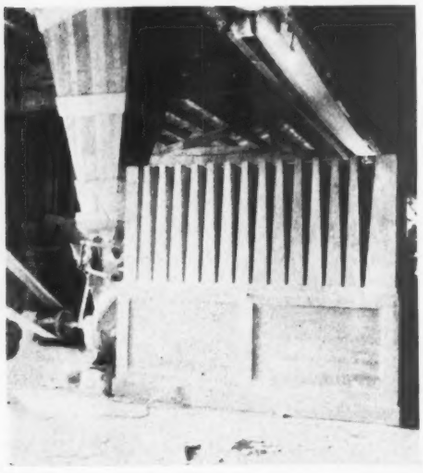
Hair fiber is mostly used and is purchased in 400-lb. bales, and is shredded in a small offset from the mixer operator's room. Retarder is purchased from the National Retarder Co., Chicago, Ill. Wood fiber is made on two automatic lathes placed in a small building separate from the main plant.

The sacked material is trucked a considerable distance for car loading or for storage purposes in the warehouse, that is part of the sacking building. The large warehouse is necessary to store the many varieties of materials made by the company. Besides all the usual classes and grades of plaster in paper and jute sacks, ground lime, hydrated lime, putty, whiting, "Insulex," wallboard and tile are also manufactured at this plant. Gypsum plaster is supplied in 50-lb. paper sacks and 100-lb. jutes; hydrated lime, in 25- and 50-lb. sizes. The small sized gypsum container is very popular with this company's customers, as they are mostly small farming towns, and the amount of plaster that each individual job uses is small. To ship in car lots to these dealers means that other than plaster must be included in the car, so a widely diversified line of building material is carried. In addition, for a $15 switching charge, cars can be put partly loaded on the Canada Cement Co.'s tracks for additional loading of cement. B. Cameron, sales manager for the company, states that the company supplies upwards of 1300 small dealers in the provinces of Ontario, Manitoba, Alberta and Saskatchewan.

Hydrated Lime Plant

Adjoining the warehouse and in the same

structure, the company has a hydrating plant for the production of their "Empire" brand of hydrated lime. The burned lime is purchased from the Winnipeg Supply and Fuel Co. and delivered to the plant in car lots, where it is unloaded direct to a Williams



Secondary pulverizer for preparation of dry insulating filler

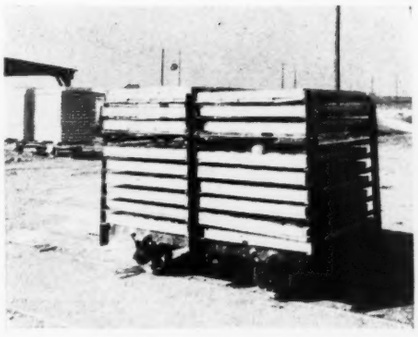
hammer mill, elevated and passed over a set of "Newaygo" screens, the oversize returning to the grinding unit. The fines pass to bins that supply the weighing hopper at the Clyde hydrator. After hydration, the lime falls to bins and by a conveyor and elevator is delivered to the Raymond No. O pulverizer and the No. 11 fan used in conjunction with this mill delivers the ground products to bins that serve the 4-tube Bates packer. The hydrate plant's equipment is driven by a 100-hp. Fairbanks-Morse type B.V. induction motor, and a 100-hp. Allis-Chalmers motor.

The lime used is a white, dolomitic lime and is burned in kilns located at Stonewall, 20 miles north of Winnipeg. The same company produces a high calcium lime as well, for paper mills and for water softening.

Keene's Cement

The company has a small, vertical type

High speed cutter (left) and the shredder (right) used in initial preparation of Insulex

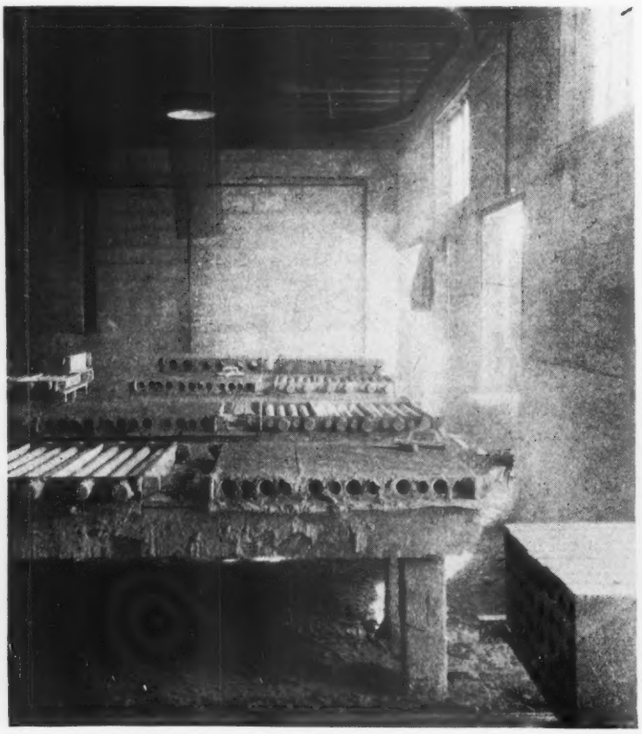


Trays of "whiting" in the trucks ready to go to the yard for air drying

kiln that consists of a tube, the walls of which are of fire brick, 4 in. thick. This kiln is filled with selected sized stone, 1½-in. to 2-in., and fired by an exterior firebox so designed that the heat passes around the brickwork, no direct flame being in contact with the gypsum. The charge is kept at a cherry-red heat for 48 hours and is then drawn and cooled. The product is mixed with 2% of alum, after which the cement is ground to 95% minus 100-mesh in a Schultz-O'Neill mill and sacked by hand in 100-lb. jute sacks. This cement sets in 1½ to 2½ hours.

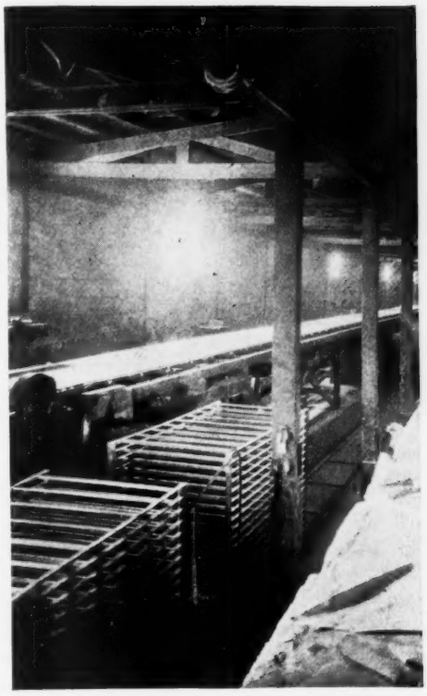
Waterproofing Compound

Another interesting product of the plant is their "Empire" waterproofing material, which consists of edible tallow mixed with hydrated lime and heated to 400 deg. F., when a chemical reaction takes place that causes the mixture to expand, after which



A corner of the molding room where gypsum tile are made

Partition tile drying in the yard. Note the reinforced ends of the roof tile in the truck



The wallboard machine at the extreme left and the racks for the green board in the foreground

the fire is drawn and additional $Ca(OH)_2$ is added to act as a filler. For a charge of 400 lb. tallow and 400 lb. of hydrate, 1000 lb. more of lime hydrate is necessary for the filler. After the compound has cooled it is ground as fine as possible in a Schultz-O'Neill mill and sacked for shipment. About 2% of this product is added to portland cement for waterproofing purposes.

Still another diversion from the usual operation found in a gypsum mill is the whitewash product, known as "Albaqua," or water-alabaster whitewash. This consists of a mixture of 70% hydrated lime, sugar, finely ground raw gypsum and whiting, which after thoroughly mixing is ready for use. This material sticks to wood, brick or cement with perfect adhesion and finds a ready market in that territory for a cheap and reliable whitewash.

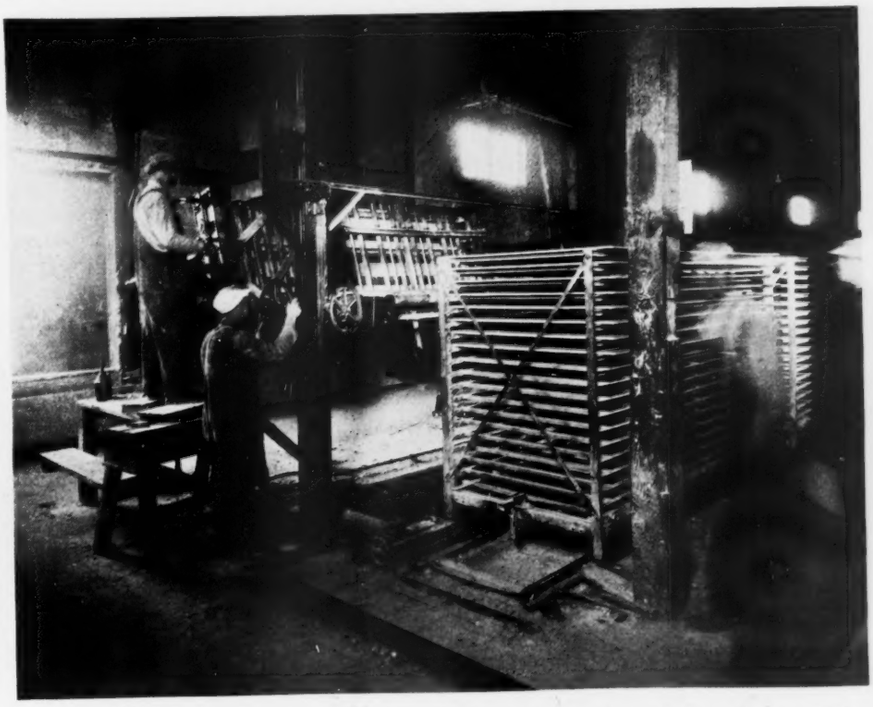
Whiting and Putty Plant

Putty and whiting are made at this plant by adding water and quicklime until a thin slurry results, the operation being conducted in a vat with mechanical agitation, after which the slurry passes to a small ball mill and is ground to extreme fineness. The ground slurry passes to a home-made classifier where the coarser particles settle out and are, from time to time, shoveled out and rejected. The finer portion passes to a tank and is allowed to settle, after which the thicker portion is withdrawn from the bottom by a small pump and passed to a 4-ft. Portland continuous rotary filter. The cake from this filter is spread out in small wood trays, and after air drying is ground in a Schultz-O'Neill mill and hand-sacked for shipment. By this equipment 400 tons per year of whiting is produced, of which a large percentage is used for putty.

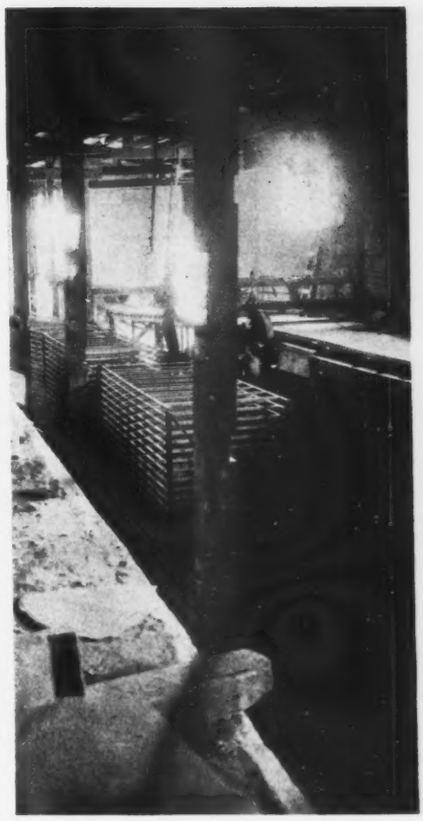
Gypsum Tile

The stucco from the hot pit elevator passes by a conveyor to a separate building paralleling the main structure, and is deposited in a small bin over the wet-batch mixer, from where the stucco is drawn by a small screw conveyor in the bottom of the bin and falls by gravity to the mortar mixer.

The mortar mixing operation is conducted by drawing a given amount of water into a cylindrical tank, roughly 2 ft. in diameter and 5 ft. high, after which enough stucco is added to give a creamy consistency. Mixing is conducted by an ingeniously driven paddle agitator, and when sufficiently mixed, the container or tank, which is mounted on an "I" beam, is moved by an overhead trolley to the flat, hand-operated molds, where the contents are poured out into the different molds. The contents of the molds are allowed to set, after which the tile is loaded on a truck and delivered to the storage yard and air dried. Part of the storage yard is protected by a shed roof.



Tilting devices (right) passing the green board to the movable racks. A full rack of green board shows in the foreground, ready to go into the drier

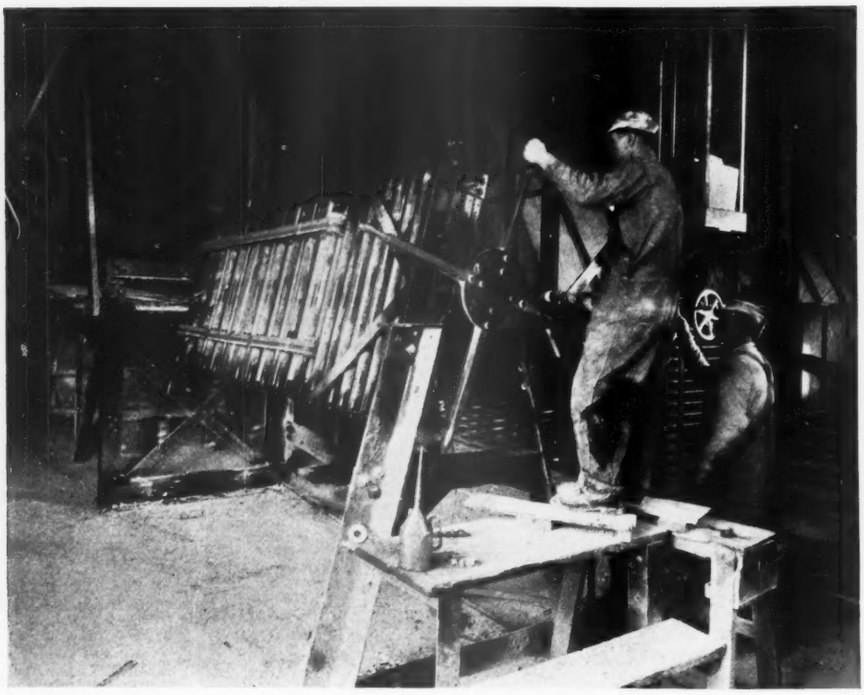


Cutting knife and take-off end of the board machine

The company manufactures 2-in. furring tile; 2-in. solid; 3-in., 4-in. and 6-in. hollow tile with dimensions of 12x30 in. They also manufacture roofing tile, but only on orders giving the desired dimensions, and for this use are prepared to produce tile up to 7-ft. span. For roofing purposes, a solid, 4-in. tile, 15 in. wide and with three 1x⅛x⅜-in. channel irons for reinforcement are sold.

Wallboard Plant

In 1923 the Winnipeg company built a wallboard plant that has a daily capacity of 75,000 sq. ft. of wallboard. This amount of board can



A closeup of the tilting device that turns the board over and slides it into the drying rack

be made in 10 hours, but the drying equipment, consisting of three tunnel type kilns, is worked to capacity to secure this production; however, it is expected to add two more tunnels to the equipment soon.

Wallboard Manufacture

The stucco is added to a short soak belt of the usual type, running parallel to the board belt. The soak belt feeds a short cross belt that discharges to a small continuous mixer, where a starch solution is added, and after thorough mixing the mortar falls through a short spout to the 52-in. Goodyear forming belt. The hot starch solution used consists of a solution of 190 lb. of starch to 300 gal. of water, which, after digestion, is diluted to 3000 gal. of use. This treatment gives a fluffier and lighter board.

The bottom paper is scored, creased, cupped and turned over by a patented device; the top paper comes over the top and is sealed as it passes through the press rolls. The board passes through two edgers and a darby belt, within 50 ft. of the press rolls, and then rides undisturbed for 320 ft. to the cutter. At the forming end the green board is passed through a chamber to which steam is supplied, and it is claimed this treatment increases the bond between board and paper. The paper used is news vat lined chipboard, supplied in 1200-lb. rolls.

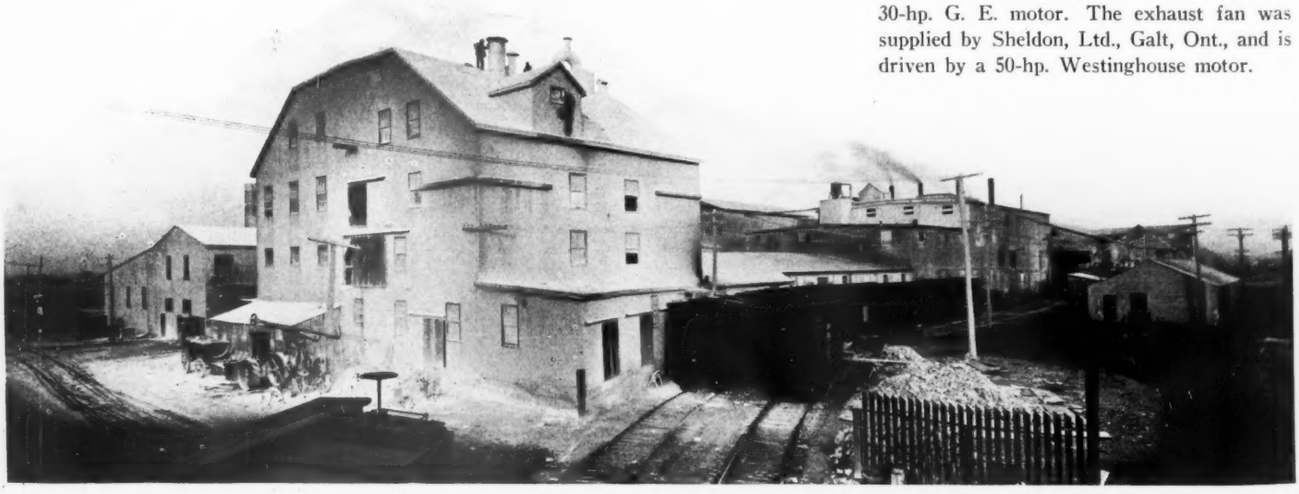
The carrier belt now used is an endless rubber, 5-ply, 52 in. wide and 720 ft. long, but this will be replaced by two shorter belts to be supplied by the Dunlop Rubber Co. This belt will have a 60-ft. and a 320-ft. section. The belt is driven by a 20-hp. motor through a Reeves, variable-speed transmission, and the balance of the makeup equipment requires 45 hp.

The board cutter used was supplied by the Knowlton Co., of Rochester, N. Y., and is a device that moves in synchronism with the belt and at predetermined length perforates the board at right angles to its length, after which the higher speed offbearing rolls complete the separation. The boards then pass to a tilting device that passes the board to movable racks that carry the green board through the tunnel kiln.

The transfer of green plaster board to the drier rack is a ticklish operation, as the board's edges must not be disturbed, the sheet must rest in a perfect plane, and the transfer must be effected without scratching or scoring the wet paper faces. This unloader was designed by W. Armstrong, western manager for the Canada company, and handles the board successfully with a minimum of loss.

Drying

The three tunnel kilns are supplied steam through 20,000 lin. ft. of 1-in. pipe, and a temperature of 190 deg. F. is maintained by this means. The drying is done in the usual manner of tunnel kilns, except that they have one fan of 55,000 cu. ft. per min. capacity. An exhaust fan pulls air at 65,000 cu. ft./min. and the air passes from this exhaust fan to a smaller fan which drives this same air, with the introduction of about 15% new heated air from the coils through two of the five kilns. This method of circulating the air is necessary owing to the short length of the kiln, which would otherwise discharge air at comparatively high temperatures and low saturation. The boiler equipment consists of one 150-hp. boiler and two low-pressure boilers. The intake fan was supplied by the Canadian Blower and Forge Co., Kitchener, Ont., and is driven by a 30-hp. G. E. motor. The exhaust fan was supplied by Sheldon, Ltd., Galt, Ont., and is driven by a 50-hp. Westinghouse motor.



Looking at the Winnipeg plant from the west side

The company has standardized on two sizes of boards, one of ⅜-in. thickness, which weighs 1500 lb. per 1000 sq. ft., and marketed under the name of "Gyproc." The second size is ¾ in. thick and weighs 3000 lb. per 1000 sq. ft., and is called "Rockboard."

The dried board is unloaded from the racks by hand to trucks that deliver the boards to the warehouse by freight elevators that serve a tunnel under the railroad tracks.

Insulex

This material is used as a dry insulating filler for filling between floor joists, filling between plastered laths and outer boards, or for filling between rafters on the ceiling backs. The raw materials used for this product are the "peerless" or otherwise damaged boards from the wallboard plant. The boards are first cut into strips about 8 in. wide, by a stationary cutter of the Knowlton type, after which they fall to a short conveyor that feeds the boards "endo" to a high-speed cutter that slashes and disintegrates the boards to about the size of corn. This material falls to two Schultz-O'Neill Co. pulverizers for final disintegration, and after sacking is ready for use. The mills are equipped with dust filters of the type shown in the illustration, and are driven by a 50-hp. Westinghouse motor.

Capacity of Plant

The plant has a capacity of 400 tons of stucco per 24-hour day, of which 40 tons is used in the wallboard plant and 10 tons used in tile production. The other 350 tons is shipped as sacked plaster. The lime hydrating plant has a capacity of 45 tons per day, the wallboard plant 75,000 sq. ft. per day, and the whiting plant produces 400 to 450 tons per season. In the entire plant 75 men are employed.

Personnel

The officers of the company are: R. E. Haire, president; C. R. Whitby, vice-president, and S. H. Reid, secretary-treasurer. The Winnipeg operation and sales are conducted from offices of the company in that city. W. Armstrong, former sales manager of the Manitoba Gypsum Co., which was absorbed by the Canada Gypsum and Alabastine Co., Ltd., is western manager. B. Cameron is sales manager and H. F. R. Baker is plant superintendent.

Left to right — Thomas Brownell, superintendent of quarries; R. E. Haire, president, and W. Armstrong, western manager

Graphite Preparation and Uses

ONE OF THE MOST COMPLETE collections of condensed general information on graphite has just been issued by the United States Bureau of Mines. The data were compiled by Paul M. Tyler, assistant to chief, economic branch.

This circular, No. 6118, lists the uses of plumbago or black lead and describes the modes of occurrence of the various forms of natural graphite such as plumbago or crystalline graphite, both vein and lump forms; flake graphite and amorphous or "black lead" graphite. Artificial graphite and the methods of its preparation are also discussed.

Some of the unusual chemical properties of natural graphite are of interest. The bulletin describes treatments by chemical means to form golden-yellow colored graphite particles, and another treatment to give a graphite which when gently heated swells to several hundred times its original volume. The chemical properties of natural graphite and of other carbon compounds, such as coke, artificial graphite, etc., are presented in such a manner that the chemist can readily see a method for making quantitative analyses.

Graphite was formerly believed to be of organic origin, but this paper points out that graphite has been found in pegmatites in Maine and New York. Some veins of graphite are said to result from condensation of carbon vapors. Graphite has been isolated in meteorites, so apparently the source of this material can be both organic and inorganic.

Graphite commonly occurs in rocks that have been folded and squeezed intensely, and often in intrusive dikes, and at any event under conditions that form irregular or lenselike deposits. Many previous unsuccessful attempts at commercial exploitation of graphite minerals can be traced to a lack of information on the size or character of the deposits. The circular calls attention to the possible errors that might occur from the different methods of core- or churn-drill prospecting. The work done by the Radiore Co. of Los Angeles, Calif., is referred to; this company has a means of demonstrating the presence of carbon by radio conductivity methods.

Several chapters discuss briefly the various methods of concentrating graphitic ores and recovering the marketable products. The older processes apparently are being replaced by the oil flotation process, as it is amenable to production of a cleaner product and of larger particle size, an important advantage, as certain users of graphite refuse to accept the finer sizes.

The chemical methods of refining graphite are all based on leaching either before or after fusion to render the non-graphitic contents soluble in acids or mixture of acids, allowing removal of the graphite by filtration or decantation.

Artificial Graphite

In the United States artificial graphite is made in large quantities by the Acheson Graphite Co., founded by Dr. Edward Acheson, who invented the first successful commercial process for making artificial graphite.

In the production of artificial graphite, anthracite coal sized to about wheat size is charged to a troughlike furnace and is made part of an electric circuit. The high resistance of the charge eventually develops an extremely high temperature, probably in the neighborhood of 7500 deg. F. The time cycle consists usually of 5 days, after which the furnace is cooled and the furnace opened up. The top layer of the charge consists of carborundum, with the graphite below. Other methods of producing artificial graphite by the electrode furnace process are also described.

There are several pages devoted to statistical data on the world's production of graphite and the domestic production of both the natural and artificial graphite.

Apparently there is no standard classification of the different grades of graphite, sales being based upon the actual samples submitted or upon the established reputation of the individual dealer. The graphites of commerce are, however, classified according to their carbon content and their physical condition. The carbon content will vary from as low as 30% to the ordinary run of 88% to 90% carbon. Still lower grades, consisting of pulverized slates with enough carbon present to color the material black, have in times past been sold as graphite. The three main classes of Ceylon graphite are as follows: Lump, ranging from size of a walnut down to a pea, ordinarily runs 90% carbon; chip, from the size of a pea to a little smaller than wheat grains; dust, from 40 to 60 mesh and contains 55% to 80% carbon.

A considerable portion of the paper deals with the distribution of consumption. Prices received are discussed in quite considerable detail. Tabulated statistics on past prices are also given.

National Lime Association Will Do Promotional Work Again

Washington, D. C., Meeting Also Drafts a Code of Business Practice in Conference with Federal Trade Commissioner Humphrey

FOR THE FIRST TIME in two years the National Lime Association will be reorganized to do aggressive promotional work to regain some of its lost markets and retain those that it still has. For the meeting of the industry at Washington, D. C., June 26-28, was the most representative one of the industry held in several years. More was accomplished, probably, than at any previous meeting of the association.

Norman G. Hough Elected President

The National Lime Association departed from all precedent in its history and elected a man not a member, not a lime manufacturer, as president and general manager. That man is Norman G. Hough, who has been managing its affairs for the past year. With the new scale of dues adopted the association will enter its fiscal year beginning July 1 with a budget of well over $100,000 a year, for three years.

The president's plan, approved by the association, for rehabilitation of the lime industry includes active assistance in the establishment of district or regional statistical bureaus, such as one or two of the district associations in the industry have already in operation (for a description of the bureau at Chicago, Ill., see ROCK PRODUCTS, March 2, 1929, p. 73-74). Such bureaus and the help they give in stabilizing market conditions have become necessities to any industry producing and selling a basic commodity.

The association will soon start a modest campaign of prestige advertising, largely in the business and industrial papers. Two new principal employes will be added to the Washington office staff—a man to handle construction uses of lime and a man for agricultural lime promotion. W. V. Brumbaugh, who has been secretary of the association and chief assistant to General Manager Hough, was elected assistant secretary and treasurer, and will head the department of chemical and industrial lime.

R. P. Wilton, of the Steacy and Wilton Co., Wrightsville, Penn., was reelected treasurer with the added title and office of secretary. The president of the association will be directly responsible to an executive committee of four or five members, four present members being: J. M. Deely, Lee Lime Corp., Lee, Mass.; H. B. Mathews, Mississippi Lime and Material Co., Alton, Ill.; J. M. Gager, Gager Lime Manufacturing Co., Chattanooga, Tenn.; Reed C. Bye, Warner Co., Philadelphia, Penn.

Directors

The directors of the association are elected by the district or regional group. Those thus far elected are:

District 1.
J. R. Linney, Chazy Marble and Lime Co., Inc., Chazy, New York.
C. L. Montgomery, Vermarco Lime Co., West Rutland, Vt.

District 2.
Reed C. Bye, Warner Co., Philadelphia, Penn.
S. Walter Stauffer, J. E. Baker Co., York, Penn.

District 3.
Ray C. Noll, Whiterock Quarries, Inc., Bellefonte, Penn.

District 4.
Election to be held.

District 5.
G. J. Whelan, Kelley Island Lime and Trans. Co., Cleveland, Ohio.

District 6.
G. J. Nicholson, Inland Lime and Stone Co., Manistique, Michigan.

District 7.
B. L. McNulty (Chairman of the Board), Marblehead Lime Co., Chicago, Ill.
E. S. Healey, Glencoe Lime and Cement Co., St. Louis, Mo.

District 8.
Election to be held.

District 9.
Henry LaLiberte, Cutler-Magner Co., Duluth, Minn.

Districts 10 and 11.
L. J. Backus, Ladd Lime and Stone Co., Cartersville, Ga.

District 12.
J. F. Pollock, Ash Grove Lime and Portland Cement Co., Kansas City, Mo.

District 13.
H. Dittlinger, Dittlinger Lime Co., New Braunfels, Texas.

District 14.
J. S. McMillin, Roche Harbor Lime and Cement Co., Roche Harbor, Washington

District 15.
C. M. Cadman, U. S. Lime Products Co., San Francisco, Calif.

Trade Practice Conference

The Washington meeting was remarkably well organized. It began on Tuesday, June 25, with a directors meeting where the final touches were given to a set of rules on regulations to govern trade practice in the industry. These have been in preparation for several months. On Wednesday, June 26, these rules were taken up and discussed one by one in an open meeting of all the industry. A. F. Myers, former chairman of the Federal Trade Commission, legal counsel for the National Lime Association presided and discussed various points brought up in detail.

H. B. Fowler, secretary of the Trade Relations Committee of the Chamber of Commerce of the United States, explained the policy of the Chamber of Commerce and stated that over 50 industries had now adopted similar codes of business practice. He emphasized the point that each industry must set up the machinery within its own organization to enforce these codes, going to the Federal Trade Commission only as a last resort.

General Manager Norman G. Hough made some preliminary remarks and introduced the chairman. In his opening remarks Chairman Myers emphasized the point that competition is still regarded as the foundation of American business; that there is no sentiment in favor of government monoplies. He said unfettered competition, however, is becoming a thing of the past; that there is real need for strong trade associations and for codes of business practice—with the will to obey such codes.

Code of Practices

The code of business practice herewith is the one finally adopted by the lime industry and officially submitted to the Federal Trade Commission at a trade practice conference on June 27, Commissioner W. E. Humphrey, presiding, assisted by M. Markham Flannery, secretary of the trade conference committee of the Federal Trade Commission. Commissioner Humphrey highly commended the industry for the dispatch with which the conference accomplished the business before it. The code follows:

"The persons, firms and corporations engaged in the production, sale and distribution of lime and lime products desiring to rid their industry of unlawful, unfair and uneconomic practices, and to secure to themselves of manifold benefits of lawful cooperation, pledge themselves to the observance of the following rules of fair competition and approved practice in the manufacture, sale and distribution of industry products, and respectfully petition the Federal Trade Commission for the approval of the same.

1. *Price Discrimination*—Not to discriminate unfairly in the prices charged to different customers of the same class for industry products; provided that this shall not prevent price discrimination necessarily resulting from differences in the grade, quality or quantity of the commodity sold, or that makes only due allowance for necessary differences in the cost of selling or transportation, or discrimination in the same or different commodities made in good faith to meet competition.

"2. *Published Prices and Terms*—To publish all prices and terms of sale separately and independently arrived at from time to time, and to adhere to such published prices and terms in dealings with all customers until new prices and/or terms are published, and then to put such new prices and terms into effect as to all customers of like class.

"3. *Maintenance of Confidence and Stability.*—Not to put into effect changes in the established marketing customs and usages of the industry calculated to impair confidence or destroy stability in the industry without such reasonable notice as will enable the industry to meet such innovations on a basis of fair and open competition.

Rebates and Bribery Condemned

"4. *Secret Rebates*—Not to allow to purchasers of industry products, whether dealers or consumers, commissions, bonuses, rebates, refunds, credits, unearned discounts, or subsidies of any kind, whether in the form of money, services, advertising, or otherwise, or give premiums, or extend to certain purchasers special terms, services, or privileges not extended to all purchasers under like terms and conditions.

"5. *Commercial Bribery*—Not to give or permit to be given to the agents, employes or representatives of customers, or the agents, employes or representatives of competitors' customers or prospective customers, money or anything of value as inducement to cause their employers or principals to purchase or contract to purchase industry products, or to influence such employers or principals to refrain from dealing or contracting to deal with competitors.

"6. *Inducing Breach of Contract*—Not to willfully interfere with any existing contract between any other manufacturer and a wholesaler, retailer, consumer, or other party, involving or relating to the sale of industry products, such interference being for the purpose or with the effect of dissipating, destroying or appropriating, in whole or in part, the business represented by such contract.

"7. *Selling Products Below Cost*—Not to sell industry products below cost for the purpose of injuring a competitor and/or lessening competition

"NOTE.—Cost, as used in the preceding paragraph, shall be construed to include among other items the cost of raw materials, transportation thereof, manufacturing, depreciation, depletion, obsolescence, fixed charges, selling and administrative expenses.

"8. *Defamation of Competitors*—Not to defame or disparage a competitor, directly or indirectly, by words or acts which untruthfully call in question his business integrity, his ability to perform his contracts, his credit standing, or the quality of his product.

Containers

"9. *Fraudulent Containers*—To observe strictly the provisions of the Act of Congress approved August 23, 1916, Pub. No. 228, 64th Congress, entitled, 'An Act to Standardize Lime Barrels' in all transactions.

"NOTE.—Said act provides: 'There is established a large and a small barrel of lime, the large barrel to consist of 280 lb. and the small barrel to consist of 180 lb., net weight.

" 'It shall be unlawful for any person to sell or offer for sale lime imported in barrels from a foreign country, or to sell or offer for sale lime in barrels for shipment from any state or territory or the District of Columbia, to any other state or territory or the District of Columbia, unless there shall be stenciled or otherwise clearly marked on one or both heads of the small barrel the figures "180 lb. net" and on the large barrel the figures "280 lb. net" before the importation or shipment, and on either barrel in addition the name of the manufacturer of the lime and where manufactured, and, if imported, the name of the country from which it is imported.

" 'When lime is sold in interstate or foreign commerce in containers of less than the standard small barrel, it shall be sold in fractional parts of said standard small barrel, and the net weight of lime contained in such container shall be stenciled or otherwise be clearly marked thereon, together with the name of the manufacturer thereof, and the name of the brand, if any, under which it is sold, and, if imported, the name of the country from which it is imported.

" 'Rules and regulations for the enforcement of sections 237 to 242 inclusive, not inconsistent with the provisions of said sections, shall be made by the Director of the Bureau of Standards and approved by the Secretary of Commerce and such rules and regulations shall include reasonable variations or tolerances which may be allowed.

" 'It shall be unlawful to pack, sell, or offer for sale, for shipment from any state or territory or the District of Columbia to any other state or territory or the District of Columbia, any barrels or other containers of lime which are not marked as provided in sections 238 and 239, or to sell, charge for, or purport to deliver from any state or territory or the District of Columbia to any other state or territory or the District of Columbia, as a large or small or a fractional part of said small barrel of lime, any less weight of lime than is established by the provisions of sections 237 to 242 inclusive, and any person guilty of a violation of the provisions of sections 237 to 242, inclusive, shall be deemed guilty of a misdemeanor and be liable to a fine not exceeding $100.

" 'It shall be the duty of each district attorney, to whom satisfactory evidence of any violation of sections 237 to 242, inclusive, is presented, to cause appropriate proceedings to be commenced and prosecuted in the United States court having jurisdiction of such offense."

"10. *Use of Old Packages*—Not to sell lime or permit it to be sold in used barrels bearing the brand, label or name of a producer or dealer other than the one producing or selling the product contained therein where the purpose or effect may be mislead or deceive the purchaser as to the source of production, grade, quality or quantity of such product.

Imitations of Trade Marks

"11. *Misrepresentation*—Not to sell or offer for sale any industry product for the purpose or with the effect of deceiving customers or prospective customers as to the quantity, quality, or grade of such product.

"12. *Imitation of Trade Marks and Trade Names*—Not to imitate or to simulate in such degree as to give rise to uncertainty or confusion the trade mark, trade name, package, brand or label of a competitor.

"13. *False Branding*—To be scrupulously accurate in all markings, brands and labels and to avoid any and all shipments the purpose or effect of which may be to mislead or deceive purchasers as to the quantity, quality, grade or substance of the goods purchased.

"14. *Deviations from Standards*—Not to deviate from the established practices of the industry as regards the grade, quality or substance of standard industry products, or the size of packages or containers of such standard products.

"15. *Inducing Sales by Other Products*—Not to offer any article or commodity, whether an industry product or not, at prices below those prevailing in the competitive market or at less than their fair value, or without a profit, as inducement for the purchase of one or more industry products.

"16. *Cost Accounting*—To observe approved cost accounting methods in the conduct of business.

"NOTE.—Cost, as used in the preceding paragraph, shall be construed to include among other items the cost of raw materials, transportation thereof, manufacturing, depreciation, depletion, obsolescence, fixed charges, selling and administrative expenses.

Anti-Dumping Provisions

"17. *Anti-dumping*—Not to ship quantities of merchandise into territories remote from the territories customarily served for the purpose of selling them at prices below the market in such remote territories.

"18. *Consigned Goods*—Not to ship lime or lime products on consignment.

"19. *Transit Shipments*—Not to make any shipments other than those involving mere transfers of materials to the warehouses or plants of the shipper without having an order from the customer for the shipment at the time shipment is made.

"20. *Discrimination by Brokers, Jobbers and Distributors*—That lime manufacturers who sell their products through brokers, jobbers or distributors, wholly or in part, shall use their best efforts to bring about the observance of these rules of approved practice by such brokers, jobbers and distributors.

"21. *Definition of Jobber or Distributor*—A jobber or distributor shall be defined as any person, firm or corporation who is engaged in the business of selling lime or lime products, either exclusively or with other materials, but is not engaged in the manufacture of the particular type or class of

lime or lime products, and who sells the materials to another person, or to another firm or corporation in which he is not financially interested, for purposes of resale, and who carries the account and/or is responsible for the credit risk of the shipment.

"22. *Conference Information*—The Trade Relations Committee of the National Lime Association is hereby constituted the source within the industry from which manufacturers may secure information relating to the Trade Practice Conference and all rules adopted thereby.

"23. *Continuation of Conference* — Resolved that this conference of the lime industry be continued as a permanent conference for the suppression of unfair trade practices and that the Trade Relations Committee of the National Lime Association investigate alleged violations of these resolutions and make complaints to the Federal Trade Commission, and, if deemed advisable, such Trade Relations Committee may request the Federal Trade Commission from time to time to call new conferences of the industry for the purpose of amending those resolutions.

"Resolved further that such committee be authorized to send its accredited representative from time to time to the places of business of any or all manufacturers to make such investigations or inspections as may be necessary to determine whether the resolutions adopted by this conference are being observed in letter and in spirit.

"24. *Approval of Changes* — The Trade Relations Committee of the Lime Industry is hereby authorized on behalf of the Industry to approve or disapprove any changes or modifications made by the Federal Trade Commission in the Resolutions adopted at the Trade Practice Conference on June 27, 1929."

New Constitution Adopted

The constitution of the National Lime Association adopted in 1919, was so amended as to practically new. Here it is:

"1. The name of the Corporation shall be the National Lime Association.

"2. The location of the main business office of the corporation shall be determined by the board of directors.

"3. The object of the corporation shall be to promote the general improvement of the industry of manufacturing and selling lime and lime products; to foster the interests of its members and those in any way related to the lime industry by common business interests; to secure freedom from unjust exactions or legislation; to develop higher standards of business practice in the industry; to establish uniformity in the customs of the industry and commercial usages of the products; to acquire, preserve and disseminate valuable business information; to promote an enlarged and more friendly intercourse among those engaged in the industry; to promote the growth of the industry through expansion of its possibilities and by developing a wider market for its products through researches, investigations and through the dissemination of facts to consumers and the public; and the doing of all things incidental or conducive to the attainment of the above objects not inconsistent with the public interest, the certificate of incorporation, or the laws of our land.

"Neither the corporation nor any of its operating staff shall in any way deal with the making of market prices on lime or lime products.

"The corporation shall be prepared to act in an advisory capacity to district promotional organizations in connection with carrying out and putting into operation the program of the corporation, but it shall not in any way assume or be responsible for the acts, resolutions or activities of any district, auxiliary or other association in the lime industry.

"4. The management of the corporation shall be vested in the board of directors. The manner after which this board shall be nominated and elected is defined in the by-laws.

"The board of directors may appoint an executive committee of no more than five (5) to manage the affairs of the corporation between meetings of the board of directors.

"5. The corporation shall have no capital stock, and the members thereof shall be composed of the subscribers and of such persons as may from time to time be admitted by vote in such manner and upon such requirements as may be prescribed by the by-laws. The corporation shall, nevertheless, have power to exclude, expel, or suspend members for just or legal cause subversive of the best interests and morals of the business and in such legal manner as may be ordained and directed by the by-laws.

"6. The by-laws of the corporation shall be admitted and taken to be its laws subordinate to this constitution and the constitution of the United States; they shall be altered and amended as provided for by the by-laws themselves, and shall prescribe the powers and functions of the board of directors herein mentioned and those to be thereafter elected, the times and places of meetings of the board and this corporation, the number of members who shall constitute a quorum at the meetings of the corporation, and of the board, the qualifications and manner of electing members, the manner of electing officers, and the powers and duties of such officers, and all others concerned, and all internal arrangements of said corporation.

"7. Proposed amendments to the constitution, signed by at least three (3) members must be presented in writing to the board of directors at least four (4) weeks before the next meeting of the corporation. In the notices of this meeting the proposed amendment or amendments shall be printed. At the meeting the proposed amendment or amendments may be discussed and adopted by a two-thirds vote of those present, but if amended it or they shall be passed to letter ballot. If two-thirds of the vote obtained by letter ballot are in favor of the proposed amendment or amendments as amended, it or they shall be adopted

By-Laws

Article 1—Membership

"Section 1—*Classes.* The membership of the corporation shall consist of two classes: (a) active; (b) allied.

"Section 2—*Qualifications of Membership.* Any firm, corporation or individual directly engaged in the manufacture of lime or lime products in the United States of America or territories thereof, is eligible for membership as an active member

"Any firm, corporation or individual directly engaged in the manufacture of lime in the Dominion of Canada is eligible for membership as an allied member.

"Section 3—*Election of Members.* Any firm, corporation or individual eligible as an active member can become a member of the corporation upon being proposed by two active members of the association and being elected by a majority of the board of directors.

"Any firm, corporation or individual eligible to membership as an allied member can become a member of the corporation upon being proposed by two active members of the corporation and being elected by unanimous vote of the entire board of directors by letter ballot.

Rights of Members

"Section 4—*Voting Privileges.* Each active and allied member shall appoint one of its officers, or other member of its staff, who shall be the personal representative of such member and who shall represent, vote and act for the member in all of the affairs of the corporation, including the holding of office therein.

"Any active or allied member of the corporation, in case of absence from any meeting, may give its written proxy to vote to the accredited representative of any other active or allied member.

"Section 5—*Duration of Membership.* Any firm, corporation or individual admitted to membership in pursuance of these by-laws shall be a member of the association until his membership shall terminate by death, voluntary withdrawal, or otherwise in pursuance of these by-laws.

"The right of a member to vote and all other rights, title, and interest of a member in or to the corporation, its rights, privileges and property, shall cease on the termination of his membership

"Any member may withdraw from the corporation by fulfilling all obligations to it by giving written notice of such intention to the secretary, which notice shall be presented to the board of directors or executive committee at the first meeting after its receipt.

"Section 6—*Suspension or Expulsion.* A member may be suspended for a period or expelled for cause, such as violation of the by-laws or for conduct prejudicial to the best interests of the corporation or the industry. Such suspension or expulsion shall be by three-quarters vote of the membership of the board of directors, provided that a statement of the charges shall have been mailed by registered post to the member under charges at his or its last recorded address at least fifteen days before final action is taken thereon; this

statement shall be accompanied by a notice of the time when and place where the board of directors is to take action in the premises provided that the said member shall have been given an opportunity to present a defense at the time and place mentioned in such notice.

"Section 7—*Division of Members.* The active members of the association shall be divided into at least fifteen districts as provided by these by-laws.

"Any district may form, or two or more districts may combine to form, a district or auxiliary organization for the purpose of co-ordinating and aiding in the general objects of the corporation as may not be inconsistent with the by-laws or interfere in any way with the activities or affairs of the corporation.

Dues

Article 2—Dues

"Section 1—The fiscal year shall begin on the first day of July and all annual dues shall be payable monthly in advance.

"The annual dues of active and allied members for the succeeding year shall be fixed by vote of the membership at the annual meeting of the corporation and shall be based upon the total tonnage of quick and hydrated lime sold by each member during the preceding calendar year.

"The board of directors shall submit a budget for the succeeding year, which shall serve as the basis for fixing the rate of dues for active and allied membership.

"The budget adopted shall run for the fiscal year of the corporation unless otherwise changed. By a three-fourth vote of the entire board an increase in the amount of active and allied dues may be recommended for any part of the current fiscal year to meet special emergencies, or otherwise as may be deemed necessary for the general welfare of the corporation.

"Such recommendation shall be acted upon by members of the corporation either in special meeting or by letter ballot.

"Section 2—Members who fail to pay their dues within thirty days from the time same become due, shall be notified by the secretary and if payment is not made within the next succeeding thirty days, the member shall be reported to the board of directors as in arrears, and, if ordered shall be dropped from the rolls and thereupon forfeit all rights and privileges of membership.

Article 3—Meetings

"Section 1—*Annual.* There shall be an annual meeting of the corporation for the purpose of electing the board of directors for receiving the annual reports; for fixing dues for the succeeding fiscal year and for the transaction of such other business as may come before the meeting. The time and place for holding the annual meeting shall be fixed by the board of directors.

"Section 2—*Special.* Special meetings may be called when and at such places as the board of directors may deem necessary or upon written request to the president of ten active members.

"Section 3—*Quorum.* A majority of the active and allied members shall constitute a quorum. Written proxies tendered by absent members shall be accepted in the majority count.

Governing Board

Article 4—Board of Directors

"Section 1—*Government of Corporation.* The management of all properties, affairs, business, and concerns of the corporation shall be in the board of directors, consisting of at least fifteen members. Members of the said board shall, upon election, immediately enter upon the performance of their duties and shall continue in office until their successors shall be duly elected and qualified. A chairman shall be elected from among the membership of the board.

Districts

"Section 2—*Election.* There shall be at least one director elected from each of the following fifteen districts, being elected by the active members with plants located in the respective district.

District 1—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island and that portion of New York east of the 77th meridian.

District 2—New Jersey, Delaware, Maryland and that portion of Pennsylvania east of the 77th meridian.

District 3—West Virginia and that portion of New York and Pennsylvania west of the 77th meridian.

District 4—Virginia, North Carolina and South Carolina

District 5—Ohio.

District 6—Michigan.

District 7—Illinois, Indiana, and that portion of Missouri east of the 93rd meridian.

District 8—Wisconsin.

District 9—North Dakota, South Dakota, Minnesota and Iowa.

District 10—Kentucky.

District 11—Tennessee, Mississippi, Alabama, Georgia and Florida.

District 12—Nebraska, Kansas, Oklahoma, Arkansas, Louisiana and that portion of Missouri west of the 93rd meridian.

District 13—Texas.

District 14—Washington, Oregon, Idaho, Montana, and Wyoming.

District 15—California, Nevada, Utah, Arizona, Colorado and New Mexico.

Directors

"Any district having members' annual tonnage in excess of 200,000 tons is entitled to elect a second director. Any district having annual members' tonnage in excess of 400,000 is entitled to elect a third director. The tonnage of the members in each district in good standing on April first of each year, based on the production of the preceding calendar year, shall be ascertained by the secretary on standard report form, and the total by districts reported to all of the members of each district for their guidance in the election of directors for the ensuing year.

"If the membership of any two or more adjacent districts shall, by a majority vote of their members in each district, agree that the interests of their several districts are better served by their acting in conjunction, they may so report to the board of directors and shall then be authorized to elect such number of directors from their joint membership as may be warranted by the combined tonnage of their members. The combined district shall be designated by their separate members as outlined above in this session.

"Any director may be elected to succeed himself.

"Allied members, upon request of the board of directors, may elect one or more members.

"Section 3—*Duties.* The board of directors shall have the power to hold meetings at such times and places as they may think proper; to admit members and suspend or expel them; to appoint committees (except such standing committees as may be provided for in these by-laws) on particular subjects, from the members of the board or from other active or allied members of the corporation; to audit bills and disburse the funds of the corporation; to print and circulate documents and publish articles; to carry on correspondence in relation to the corporation's affairs and to devise and carry into execution such other measures as they may deem proper and expedient to promote the objects of the corporation and to best protect the interests and welfare of the members.

"The board of directors shall appoint an executive committee of not more than five (5) to manage the affairs of the corporation between meetings of the board.

"Section 4—*Meetings.* The regular meeting of the board of directors shall be held either during the annual meeting or not later than the day immediately succeeding such meeting. The president may call meetings at such times and places as he may deem necessary.

"Section 5—*Quorum.* A majority of the membership of the board of directors shall constitute a quorum for the tranaction of business. In the absence of the chairman, the quorum present may choose a chairman for the meeting.

"Section 6—*Vacancies.* Any vacancies that may occur on the board of death, resignation, or otherwise, may be filled by the president calling a special election of the district from which the vacancy occurred.

Article 5—Executive Committee

"Section 1—The executive commitee shall be responsible for the management of the corporation between meetings of the board of directors. It shall elect a chairman from among its own members.

"Section 2—*Meetings.* Meetings may be held at such times and at such places as may be deemed advisable by the chairman or the president.

"Section 3—*Quorum.* A majority of the members of the executive committee shall constitute a quorum at any meeting for the transaction of business.

"Section 4—*Vacancies.* Any vacancies that may occur on the executive committee by death, resignation, or otherwise, may be filled by appointment by the board of directors at its next meeting.

"Section 5—*Ratification.* Minutes of all meeting of the executive committee shall be kept by the secretary, and all the acts, resolutions and activities of the committee shall be presented to the board of directors for ratification at the next meeting of the board.

Article 6—Order of Business

"Section 1—The order of business shall be as follows at all metings of the corporation; board of directors and executive committee:

"Roll call.
"Readings of minutes of last meeting.
"Reports of officers.
"Reports of committees.
"Unfinished business.
"New business.

"Any question as to priority of business shall be decided by the chair, undebated.

"Section 2—This order of business may be altered or suspended at any meeting by a majority of the members present.

"Section 3—Any motion or resolution made or offered at any meeting shall, upon request, be reduced to writing and furnished to the secretary, before the question is put.

Officers

Article 7—Offiers

"Section 1—The officers shall be a president, a secretary, a treasurer and a general manager. These officers shall be elected by the board of directors at an organization meeting to be held during each annual meeting, such elections to be ratified by the corporation members.

"All officers shall hold office for one year or until their successors have been elected and take office. The functions of two or more of the offices may be combined in one person.

"Officers elected by the board of directors need not be the duly accredited representatives of active or allied members in good standing. Any officers elected by the board who are not the duly accredited members in good standing shall not be entitled to vote in the deliberations of the board.

Article 8—Duties of Officers

"Section 1—*President.* The president shall be the executive officer of the corporation. He shall see to the enforcement of the by-laws and shall carry into execution all resolutions of the corporation, of the board of directors, and of the executive committee; he shall be responsible for the detail accomplishment of the objects of the corporation; he shall employ all help necessary and within the limitations of the budget. If for any reason the president is unable to perform his duties, the chairman of the board of directors shall act as the executive officer of the corporation.

"Section 2—*Secretary.* It shall be the duty of the secretary to give notice of all meetings of the corporation, of the board of directors, and of the executive committee; keep a record of all proceedings at such meetings; compile official reports of the tonnage of members; collect the dues and forward the same to the treasurer; prepare in duly attested form the vouchers for all payments made by the treasurer, and preserve the same after checks have been drawn; preserve all communications received by him pertaining to the affairs of the corporation; and perform such other duties as are assigned to him by the board of directors.

"The secretary shall give an approved bond for the faithful performance of his duties, the expense of which shall be borne by the corporation.

"Section 3—*Treasurer.* The treasurer shall receive the dues of the members and all other moneys belonging to the corporation, and shall deposit them in a depository to be designated by the board of directors. He shall pay out such moneys only upon the approval of the president or general manager, in accordance with vouchers showing the details of such accounts, which shall be preserved in the office of the secretary. He shall keep proper books of account, which shall be open at all times to the inspection of the board of directors, and the executive committee, and at the close of his term of office he shall deliver to his successor all moneys, books, papers, and other valuables belonging to the corporation which shall be in his custody or possession.

"The treasurer shall give an approved bond for the faithful performance of his duties, the expense of which shall be borne by the corporation.

"Section 4—*General Manager.* The general manager shall be the executive officer for the board of directors in the absence of the president. He shall be responsible for the detail accomplishment of the objects of the corporation, and shall employ all help necessary and within the limitations of the budget.

Committees

Article 9—Standing Committees

"Section 1—*Trade elations Committee.* This committee shall consist of all members of the board of directors. The chairman of the board of directors shall serve as chairman of the committee. It shall be the duty of this committee to use every lawful means available to see that the rules governing trade practices of the lime industry, as may be provided by the Federal Trade Commission, or other governmental department, or those which may be adopted at any annual or special meeting of the corporation, shall be adhered to by all members of the industry.

"In the performance of this duty the committee shall be empowered to receive complaints of violations of such rules; make investigations to determine the correctness thereof and endeavor to have offending manufacturers cease the violations and finally, if necessary, officially place the matter before the Federal Trade Commission or Department of Justice for such action as it may deem wise and proper, provided, that no complaint shall be made to the commission prior to an offender having been informed of the committee's intention so to do, and that such official complaint shall not be made until fifteen days from the date of notice to the offender shall have expired.

"In the performance of this duty; the committee may appoint its accredited representative to receive complaints, make investigations, and present a report to the committee for its consideration.

"When and as the committee receives complaints, the chairman may appoint a sub-committee of three members to handle each complaint, provided that no member of the sub-committee shall have a plant or plants in the same district as the manufacturer against whom complaint is made.

"Each sub-committee shall be empowered to settle all complaints given into their charge, but no sub-committee shall have power to lodge official complaints with the Federal Trade Commission or Department of Justice against any offender except as specifically provided in these by-laws.

Article 10—Compensation

"Section 1—*Expenses.* Railroad and pullman fares of members of the board of directors, as well as meals while en route, not including hotel or meal expenses at place of meeting, shall be borne by the corporation on such trips as are necessary in the discharge of their duties, except such expenses as may be incurred in attending annual or special meetings of the corporation.

"Railroad and pullman fares of the executive committee, together with hotel and all meal expenses, shall be borne by the corporation on such trips as are necessary in the discharge of their duties, except such expenses as may be incurred in attending annual or special meetings of the corporation.

"Section 2—*Salaries.* Such salaries as may be paid officers of the corporation, shall be fixed by the board of directors.

Article 11—Mail Vote

"Section 1—Whenever in the judgment of the board of directors any question shall arise which they shall consider should be put to a vote of the active and allied membership and they shall deem it inexpedient to call a special meeting for such purpose, the directors may submit such matter to the membership in writing by mail for vote and decision, and the question thus presented shall be determined according to favorable vote of two-thirds of the votes received by mail within three weeks after such submission to the membership.

Article 12—Amendments

"Section 1—Proposed amendments to these by-laws, signed by at least three members, must be presented in writing to the board of directors at least four weeks before the next meeting of the board. In the notice of this meeting, the proposed amendment or amendments shall be printed. At the meeting the proposed amendment or amendments may be discussed and adopted by a two-thirds vote of those present, but if amended, it or they shall be passed to letter ballot by the active and allied members If two-thirds vote obtained by letter ballot are in favor of the proposed amendment or amendments it or they shall be adopted."

Entertainment

The Valve Bag Co. of America, Toledo, Ohio, contributed a banquet and entertainment on Thursday night, June 27, which was in every way equal to those which the company has been noted for.

Registration

A

Joseph C. Aldous, Mississippi Lime and Material Co., Alton, Ill.

B

Frances Baker, Baker Stone Co., Bloomsburg, Penn.
J. K. Barbour, Washington Building Lime Co., Baltimore, Md.
L. C. Barrick, S. W. Barrick & Sons, Woodsboro, Md.
U. S. Blecher, H. D. Millard, Annville, Penn.
B. Brennan, Valders Lime and Stone Co., Valders, Wis.
H. G. Bridgewater, Superior Lime and Hydrate Co., Pelham, Ala.
Michael Brisch, Rockwell Lime Co., Chicago, Ill.
Mrs. Michael Brisch, Rockwell Lime Co., Chicago.
R. C. Brown, Western Lime and Cement Co., Milwaukee, Wis.
J. R. Boyd, National Crushed Stone Association, Washington, D. C.
W. V. Brumbaugh, National Lime Association, Washington, D. C.
W. A. Buschman, *Pit and Quarry,* Chicago, Ill.
Charles Bye, Warner Co., Wilmington, Del.
Reed C. Bye, Warner Co., Wilmington, Del.

C

Charles M. Cadman, U. S. Lime Products Corp., San Francisco, Calif.
Dr. Jessie N. Carpenter, Allwood Lime Co., Manitowoc, Wis.
Judge A. C. Carson, Riverton Lime Co., Riverton, Va.
William E. Carson, Riverton Lime Co., Riverton, Va.
F. C. Cheney, Cheney Lime Co., Birmingham, Ala.
J. H. Chiles, Austin White Lime Co., Austin, Tex.
C. C. Cole, Longview Lime Works, Longview, Ala.
C. H. Corbett, Valve Bag Co., Toledo, Ohio.
Bolton L. Corson, G. and W. H. Corson, Plymouth Meeting, Penn.
Philip L. Corson, G. and W. H. Corson, Plymouth Meeting, Penn.
F. W. Cramer, York Valley Lime and Stone Co., York, Penn.
William T. Cullion, Burton K. Harris, Saylesville, R. I.

D

F. E. Davis, National Gypsum Co., Buffalo, N. Y.
Frank L. Davis, National Lime Association, Washington, D. C.
J. M. Deely, Lee Lime Corp., Lee, Mass.
John C. Denison, National Mortar and Supply Co., Pittsburgh, Penn.
John C. Dillon, E. Dillon's Sons, Inc., Indian Rock, Va.
L. P. Dillon, E. Dillon's Sons, Inc., Indian Rock, Va.
Ivan R. Drechsler, Kentucky Portland Cement and Lime Co., Baltimore, Md.

John G. Drummond, Indiana Limestone Co., Bedford, Ind.
J. L. Durnell, Pennsylvania Lime Products Co., Philadelphia, Penn.

E

L. M. Eaton, North American Cement Corp., 285 Madison Ave., New York City.
Gerald Egan, Cement Information Bureau, 25 Broadway, New York City.
W. L. Ellerbeck, National Lime and Stone Co., Salt Lake City, Utah.

F

G. H. Faist, Woodville Lime Products Co., Toledo, Ohio.
A. P. Ferguson, Powhatan Lime Co., Strasburg Junction, Va.
M. Markham Flannery, Federal Trade Commission, Washington, D. C.
Burton A. Ford, Valve Bag Co., Toledo, Ohio.
Henry P. Fowler, Chamber of Commerce, Washington, D. C.
James Fryer, Wisconsin Lime Manufacturers Association, Chicago, Ill.

G

J. M. Gager, Gager Lime Manufacturing Co., Chattanooga, Tenn.
R. C. Greenland, Blair Limestone Co., Martinsburg, W. Va.
J. H. Grove, M. J. Grove Lime Co., Lime Kiln, Md.

H

C. R. Haden, W. D. Haden Co., Houston, Tex.
M. W. Hammond, Keystone Lime Works, Inc., Keystone, Ala.
Burton K. Harris, Saylesville, R. I.
W. R. Hazzard, Warner Co., Philadelphia, Penn.
R. E. Herr, Limeton Lime Co., Front Royal, Va.
Henry W. Hess, Arnold & Weigel, Inc., Woodville, Ohio.
E. D. Hill, Louisville Cement Co., Louisville, Ky.
William Crawford Hirsch, *Building Supply News*, 407 S. Dearborn St., Chicago, Ill.
A. J. Hoskin, *Pit and Quarry*, Chicago, Ill.
Norman G. Hough, National Lime Association, Washington, D. C.
Commissioner W. E. Humphrey, Federal Trade Commission, Washington, D. C.

J

L. E. Johnson, Finishing Lime Association of Ohio, 240 Huron St., Toledo, Ohio.

K

C. F. Kaemming, Bruns Hydrated Lime Co., Woodville, Ohio.
C. C. Keeney, Le Gore Lime Co., Le Gore, Md.
Cleason G. King, Lawrence Portland Cement Co., Rockland, Me.
W. F. King, National Mortar and Supply Co., Pittsburgh, Penn.

L

Franklin S. Lee, Quality Products Institute, Philadelphia, Penn.
J. R. Linney, Chazy Marble Lime Co., Lyon Mountain, N. Y.
Louis G. Love, National Lime and Stone Co., Findlay, Ohio.
Frank H. Luther, Washington Building Lime Co., Baltimore, Md.

M

A. B. Mack, Kelley Island Lime and Transport Co., Cleveland, Ohio.
R. S. Maslin, Rockcastle Cement and Lime Co., Baltimore, Md.
Harry B. Mathews, Mississippi Lime and Material Co., Alton, Ill.
James H. McNamara, Eagle Rock Lime Co., Eagle Rock, Va.
Bernard L. McNulty, New England Lime Co., Pittsfield, Mass., and Marblehead Lime Co., Chicago, Ill.
Marblehead Lime Co., Chicago, Ill.
Charles L. Montgomery, Vermarco Lime Co., West Rutland, Vt.
Warner Moore, Moore Lime Co., Richmond, Va.
William H. Moores, the Moores Lime Co., Springfield, Ohio.
Lindley Z. Murray (official reporter, Federal Trade Commission), S. C. Ormsby Co., 217 Broadway, New York City.
A. F. Myers, Union Trust Bldg., Washington, D.C.

N

K. M. Nahikian, Brewer & Co., Inc., Worcester, Mass.
G. J. Nicholson, Inland Lime and Stone Co., Manistique, Mich.
Ray C. Noll, Whiterock Quarries, Bellefonte, Penn.

O

Donald O'Connor, Rockland and Rockport Lime Corp., New York City.
E. L. Osborne, Knoxville Sand and Lime Co., Knoxville, Tenn.
E. L. Osborne, Kelley Island Lime and Transport Co., Atlanta, Ga.

P

J. F. Pollock, Ash Grove Lime and Portland Cement Co., Kansas City, Mo.
E. C. Powers, the Marble Cliff Quarries Co., Columbus, Ohio.
G. I. Purnell, American Lime and Stone Co., Bellefonte, Penn.

R

Henry P. Ralph, *Oil, Paint and Drug Reporter*, 1050 Nat. Press Bldg., Washington, D. C.
Russell Rarey, Marble Cliff Quarries Co., Columbus, Ohio.
Miss Elfrieda H. Roth, Sheboygan Lime Works, Sheboygan, Wis.
R. F. Rucker, Aluminum Ore Co., East St. Louis, Ill.
C. C. Robinson, Bruns Hydrated Lime Co., Woodville, Ohio.
Nathan C. Rockwood, ROCK PRODUCTS, Chicago, Ill.
A. L. Row, National Lime and Stone Co., Findlay, Ohio.
Carl R. Ruedebusch, Mayville White Lime Works, Mayville, Wis.
H. J. Russell, F. W. Wait Lime Co., Glens Falls, N. Y.
Fred H. Rutschow, the Gibsonburg Lime Products Co., Gibsonburg, Ohio.

S

R. H. Sandwisch, Arnold & Weigel, Inc., Woodville, Ohio.
S. M. Shallcross, American Lime and Stone Co., Bellefonte, Penn.
D. K. Shroyer, H. E. Millard, Annville, Penn.
Gadsden Smith and C. R. Smith, Southern States Lime Corp., Charleston, S. C.
S. C. Snead, Kimbalton Lime Co., Inc., Shawsville, Va.
W. S. Speed, Louisville Cement Co., Louisville, Ky.
Miss M. E. Squire, Allwood Lime Co., Manitowoc, Wis.
S. Walter Stauffer, J. E. Baker Co., York, Penn.
W. J. Steward, Marblehead Lime Co., Chicago, Ill.
Edw. C. Swessinger, the Kelley Island Lime and Transport Co., Cleveland, Ohio.

T

W. A. Titus, Standard Lime and Stone Co., Fond du Lac, Wis.

V

H. L. Vernia, Hoosier Lime Co., Salem, Ind.

W

Charles Warner, Warner Co., Philadelphia, Penn.
A. A. Weigel, Arnold & Weigel, Inc., Woodville, Ohio.
A. S. White, Leesburg Lime Co., Leesburg, Va.
B. B. Williams, Western Lime and Cement Co., Milwaukee, Wis.
Harold Williams, Williams Lime Manufacturing Co., Knoxville, Tenn.
Gordon Willis, Hunkins-Willis Lime and Cement Co., St. Louis, and Peerless White Lime Co.
R. P. Wilton, Steacy & Wilton Co., Wrightsville, Penn.
Fred Witmer, Ohio Hydrate and Supply Co., Woodville, Ohio.
George B. Wood, Hoosac Valley Lime Co., Inc., Adams, Mass.
George B. Wood, Rockland and Rockport Lime Corp., Rockland, Me.
Scott Wuichet, Mohawk Limestone Products Co., Mohawk, N. Y.

Opportunities Overlooked by the Lime Industry

THE EDITOR—The world at large and business in general has no sympathy for the fellow, be he manufacturer or what not, who continues to adhere to time-worn methods to produce his products, any more than the modern farmer sympathizes with the fellow who still cuts his grain with a cradle and threshes it with a flail. Science is responsible for wonderful advances in perfecting means for the manufacture of almost every commodity from pins to a battleship, and woe to him who fails to get aboard the train of progress!

Among the industries that have not profited to any appreciable degree by the innovations and discoveries by science, and have not grasped the advantages science has made possible for it, is the lime industry.

While there have been more modern lime kilns constructed and more modern equipment installed for the manufacture of a finished product, still the old-fashioned principle of the shaft kiln is the same as when that type first came into universal use. Neither has the method of producing a hydrated lime changed to a marked degree except by the installation of modern labor-saving equipment, which is often more costly to operate and maintain than was the labor it displaced. Nor has the lime industry kept step with its principal competitor, the gypsum industry, by endeavoring to perfect a modern and commercially practicable product with which to successfully combat substitute products.

The industry has shown some anxiety during the past few years because of its unstable and unsound condition in general. The conditions confronting the industry are attributed to be due to any number of causes, if the verdict of those who have endeavored to arrive at the cause and prescribe a cure are to be relied upon as being the contributing factors. Without a doubt the reasons ascribed by those who have studied conditions and given their verdict are in a large measure due to present unsound conditions. It would seem that if those who made a thorough investigation would make an honest and humble confession, they would find the main contributing factor to be a lack of foresight on the part of the industry in general.

With the aid of science the industry should long ago have been able to come through a period such as it is experiencing now. Even now science has made it possible for a lime producer to make much more money than his plant will ever make by depending upon the sale of lime alone.

It is possible that when these scientific innovations once rotate properly and in regular order, a demand will be created, especially for the better finishing limes, that plants can operate to capacity.

If every producer will avail himself of the opportunities that science opens to him, and make diligent search for new processes and new uses for his product, he will not require the work of a so-called expert to find a cause for such conditions as confront the industry today, because there will be no occasion.

A. S. DERINGER.

Rocky Ridge, Ohio.

Metallurgical Lime

OF A TOTAL of 220,514,373 lb. of reagents consumed in 1927 in the treatment by floatation of all classes of ores, 169,926,145 lb. was lime (approximately 85,000 tons).

In the treatment of copper ores lime constitutes over 90% of the total reagent consumption in terms of weight; in terms of cost, as well, it is apparent that lime must be one of the largest items. The amount of lime consumed averages a little over 4 lb. per ton of ore, whereas there is no other reagent averaging over 1/10 lb. per ton of ore.

The Unsoundness Factor in Portland Cement Manufacture

Effect of Uncombined Lime in Varying Percentages

By Alton J. Blank

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UNSOUNDNESS of portland cement can be attributed directly to the presence of excessive quantities of "free" or uncombined lime.

Free or uncombined lime in portland cement can be attributed directly to any of a number of causes which, in the opinion of the writer, rank in importance as follows:

1. Underburning.
2. Poor chemical control of raw mixtures.
3. Insufficient grinding of raw mixtures.

Practically all portland cements have present a free lime content ranging from a few tenths of one per cent. to as high as several per cent., depending entirely upon the mill and laboratory control exercised at any plant.

Factors Producing Free Lime

A well proportioned, finely ground raw mixture, when underburned, will result in there being produced a clinker which contains an excess of free lime. This clinker, unless properly seasoned and finely ground, will result in there being produced a cement of an unsound nature, possibly low in strength and dangerous for use in concrete construction.

An incorrectly proportioned, finely ground raw mixture, when well burned may result in there being produced a clinker which contains an excess of free lime and therefore is unsound.

A well proportioned, coarsely ground raw mixture, when well burned, may result in there being produced a clinker which contains an excess of free lime and therefore is unsound.

Singly, or a combination of any of the above stated factors, will usually cause to be present excessive percentages of free lime in clinker, and consequently unsoundness.

Effects of Free Lime

Free or uncombined lime may be present as quick lime (CaO), or as slaked lime $Ca(OH)_2$ in the resulting cement. A cement containing the former, when used for concrete making purposes, has its free lime slaked when coming in contact with the mixing water, and when this slaking takes place during the setting process of the concrete mixture, the strength is greatly affected, while if this slaking takes place after the setting and hardening process is completed the expansion may result in the disintegration of the concrete mass.

This is easily accounted for in that the CaO when brought in contact with water combines to form calcium hydrate according to the reaction CaO plus H_2O equals $Ca(OH)_2$ plus a certain amount of heat that is generated. Where the specific gravity of CaO ranges between 3.08 and 3.18, the specific gravity of the hydrate is only 2.078, thus the increase in the apparent volume of the oxide on being changed to the hydrate is about one and one-half times the original volume of the CaO when only water is added.

This explains the injurious effect of free lime in cement as is shown by the disintegration of concrete.

Free Lime as Affected by Wet and Dry Processes

Other things being equal, it is usually found that less unsound cement is manufactured at plants employing the wet process of manufacture than at plants employing the dry process, and this is usually attributed to the better mix control that is possible by the former process. However, as a whole, the best quality of portland cement is not always manufactured at plants employing the wet process.

In any plant where unsoundness of the cement occurs it is usually the habit of the works manager and the sales department to look askance at the plant chemist. Five times out of ten the fault can usually be found in the raw grinding and burning departments. One time out of ten the blame is actually laid at the door of these two departments, it falling the lot of the chemist to shoulder the blame for the remaining occasions.

In some plants, due to the difficult raw materials in use, the margin for soundness is very small and the combination of proper mix control, fine grinding and hard burning of the raw mixture is an absolute necessity in order to turn out a sound product.

In other plants a wide margin for unsoundness is had and it is not necessary to maintain absolute uniformity of the raw materials, neither is it necessary to grind the raw mixtures so fine nor burn the mixture any harder in order to get soundness.

In dry process plants having antiquated machinery it is not economically possible to grind raw mixtures to a fineness around 90% passing a 200-mesh screen. In these plants it is therefore not possible to carry high calcium carbonate contents in the raw mixtures. In dry process plants having little or no raw mix storage capacity it is not safe to carry too high a carbonate content in the mix due to the excessive variation that may be had from hour to hour in the material going to the kilns. Such plants manufacture an expensive as well as an inconsistent cement and are usually in trouble over the soundness problem. Not only is there required more fuel to burn such variable raw mixtures but the quality of the cement is also of a variable nature in setting and strength properties. The prime evil of unsoundness is however, underburning.

Faulty Burning Most Frequent Cause

An overlimed mixture, though well burned, may be of a very unsound nature when discharged from the kiln as clinker, yet proper seasoning will eventually cause this clinker to become sound and of good quality insofar as strength properties are concerned. A few days or a week may be required for this change to take place.

However, an over-limed mixture underburned may be so badly unsound that months are required for it to be seasoned before it will become sound and even then the quality of such clinker will be poor. The writer has known underburned clinker to be in storage for as long as eight months without becoming sound, and it could be used only by mixing small percentages of this clinker with a specially manufactured extra sound clinker.

Other things being equal, it is very difficult to burn some raw materials readily in the kiln due to their composition. As an example of a clinker of this type the following analysis is given below:

SiO_2	20.28%
Al_2O_3	8.32
Fe_2O_3	2.24
CaO	64.50
MgO	2.10
SO_3	0.44
Loss	0.38
Lime ratio	2.09

The writer's experience with a clinker of the above nature has been that at least 50% of the kiln output is initially unsound, and from several days' to a week's seasoning in storage is necessary for the unsound clinker to age out sound.

A clinker of the above order requires a fuel consumption of from 1,430,000 to 1,550,000 B.t.u. per barrel burned. This type of clinker is abrasive and is pulverized with great difficulty in the finish grinding mills.

The high alumina content contained in the clinker has proven to be responsible for the unsoundness, the difficult burning and grinding features.

Also, only a small gain in strength is had after 28 days.

On the other hand, other things being equal, a clinker of the following composition is comparatively easy to burn:

SiO_2	20.60%
Al_2O_3	6.17
Fe_2O_3	4.33
CaO	64.80
MgO	2.08
SO_3	0.36
Loss	0.40
Lime ratio	2.09

The writer's experience with a clinker of this nature has been that at least 90% of the kiln output is initially sound and that no longer than two days are required for the remaining clinker to season in storage to age out sound.

A clinker of the above order requires a fuel consumption of from 1,130,000 to 1,280,000 B.t.u. per barrel burned. A clinker of this order grinds comparatively easily in the finish mill.

A displacement of a part of the alumina content with iron oxide has been found to be responsible for the better soundness, the easier burning and grinding features.

An appreciable gain in tensile strength of a cement from the above clinker is had between 7 days and one year, this gain averaging more or less 180 lb. per sq. in.

Fine Grinding Pays

It is, of course, possible to make a normal portland cement without going to great expense; but it is usually found that the plant making the highest quality cement is also usually making it at a lower production cost than the average plant making just a normal cement.

In a dry-process plant it is true that the initial expenditures for grinding equipment, raw silo blending systems, etc., are costly. Yet, no dry-process cement plant ever lost money by grinding their raw materials to the correct fineness and by installing a raw silo blending system to insure uniformity of the mixture being sent to the kilns. This initially large investment pays dividends in the form of greater kiln-fuel economy, greater kiln output, and a sound high quality cement that meets no rejections on the market.

The writer some time ago came in contact with a cement plant where, due to inefficient and antiquated grinding equipment on the raw end, it was impossible to grind the raw mixtures to a fineness greater than 70% passing the 200-mesh screen, and in some cases this fineness was as low as 55% passing the 200-mesh screen.

Under these conditions the fuel consumption per barrel of clinker burned averaged in the neighborhood of 1,900,000 B.t.u., while the clinker was practically always of a badly unsound nature. Having ample machinery for the finish grinding end it was the custom to grind the cement very fine; in fact, it was necessary to grind the cement to a fineness averaging 93% through the 200-mesh screen in order to get soundness in the cement. This cement gave unusually high strengths and showed no retrogression in ages tested up to one year, yet the concrete poured with this cement had a tendency towards efflorescence within a few weeks after being poured.

Burning Varies with Different Raw Materials

It has been the writer's experience that cement materials that are initially hard to burn are benefited by being slightly overburned, while materials that are comparatively easy to burn are benefited by being very slightly underburned. The above stated experience, however, applies to strength qualities and not to soundness. The normal cement should therefore be well burned in order to get strength as well as soundness qualities.

Tests were made by the writer on a sample of clinker that was apparently badly underburned, the results of which are as follows:

SiO_2	20.50%
Al_2O_3	7.22
Fe_2O_3	3.88
CaO	64.28
MgO	2.17
SO_3	0.32
Loss	1.10
Free lime	7.37

This clinker was ground to a fineness of 91% passing the 200-mesh screen and sufficient gypsum added to bring the sulphur trioxide content up to normal. The specific gravity was 3.02. The cement pat was badly unsound.

Neat briquettes gave tensile strengths of 77 lb. at 24 hours; 189 lb. at 3 days; 160 lb. at 7 days; at 14 days the briquettes were found to be completely disintegrated in the storage tanks. Standard 1:3 sand briquets made up with the cement could be crumbled between the fingers at 24 hours, 3 days and 7 days, while at 14 days they too were found to be entirely disintegrated.

Unless very badly underburned, it is seldom that a normal cement will show a free lime content of higher than 2%, for above 2% or 3% of free lime in a cement one can almost always count on its being unsound.

Free Lime in Normal Cements

The average free lime content in the normal portland cement has usually been found by the writer to range between 0.35% and 0.85%. It is doubtful whether there are any portland cements of normal composition that have an average free lime content any lower than 0.40%. As yet the writer has found no cement with a free lime content lower than 0.24%. This does not, of course, apply to high alumina or other special cements, as no free lime has been determined in a number of these special cements in tests made by the writer.

Dealing with portland cements the writer has not yet discovered any great difference in cements having free lime contents of from 0.30% to 1.20%. The degree of soundness as determined by the LeChatelier expansion apparatus has not been found to be different for a cement having a free lime content between the above figures, while the setting and strength properties have also shown no market difference, tensile strength tests on various cements containing small and large percentages of free lime having been carried out for a number of months. It is, however, altogether possible that the tensile strengths of these cements at ages of one and two years may show some differences.

Free lime in cement is of course due to

TABLE I—TESTS OF FIVE CEMENTS WITH VARYING FREE LIME CONTENTS

	Sample No. 1	Sample No. 2	Sample No. 3	Sample No. 4	Sample No. 5
Chemical analysis:					
SiO_2	20.40%	20.00%	20.30%	20.00%	20.00%
Al_2O_3	6.69	6.63	6.77	6.52	6.86
Fe_2O_3	3.01	3.57	3.33	3.48	3.34
CaO	61.91	62.22	62.40	62.00	62.54
MgO	2.17	2.05	2.18	2.24	2.17
SO_3	1.92	1.97	1.90	1.88	1.88
Ignition loss	2.00	1.96	2.00	1.80	1.92
Lime ratio	2.05	2.06	2.05	2.06	2.07
Free lime present	0.56%	0.56%	1.68%	0.34%	1.12%
Fineness (through 200-mesh)	87.4	87.0	88.0	87.2	88.0
Soundness	OK	OK	OK	OK	OK
LeChatelier expansion (mm.)	2.0	2.0	1.0	1.0	2.0
Tensile strength, 1:3 sand, lb. per sq. in.:					
Age at test					
24 hours	206	147	176	165	187
3 days	224	198	308	299	290
7 days	319	308	345	330	334
28 days	400	418	429	407	407
3 months	418	455	468	432	420

various factors entering into manufacture. For example, the samples of underburned though correctly proportioned mixtures when ground to cement and found to contain percentages of free lime around 2%+, when tested, were found to be badly unsound and have expansions varying from 4.0 to 10.0 m./m. These cements did not give normal strengths in being tested after they had become sound.

Samples of overlimed, well-burned cements which were found to contain percentages of free lime in excess of 2.0%, were badly unsound on being tested fresh gave large expansions of from 4.0 to 10.0 mm. These cements gave normal strengths on being tested after they had become sound.

TABLE II—FOUR-MONTH TEST RESULTS OF VARIOUS CEMENTS

Chemical analysis:	Month No. 1	Month No. 2	Month No. 3	Month No. 4
SiO_2	20.30%	20.12%	19.80%	19.76%
Al_2O_3	6.66	6.95	6.74	6.63
Fe_2O_3	2.95	3.05	3.26	3.57
CaO	62.42	62.24	62.00	62.54
MgO	2.04	2.10	2.10	2.07
SO_3	1.95	1.88	1.91	1.78
Loss on ignition	2.04	1.96	2.12	1.86
Silica ratio	2.11	2.01	1.98	1.93
Lime ratio	2.09	2.06	2.08	2.08
Free lime present	0.59%	0.79%	0.68%	1.07%
Specific gravity	3.14	3.12	3.14	3.16
Soundness	100.0 %	100.0 %	100.0 %	100.0 %
LeChatelier expansion (mm.)	2.2	1.9	1.8	1.7
Cement fineness (through 200-mesh)	83.8	84.0	83.6	85.0
Tensile strength, 1:3 sand, lb. per sq. in.:				
Age at test				
24 hours	132	136	153	165
3 days	220	222	240	256
7 days	306	291	301	313
28 days	402	384	396	409

Tests of Cements with Varying Free Lime Content

For comparative purposes a number of finely ground cements having varying free lime contents, are given in Table I.

A study of the above results shows there to be no relation between the free lime present in the cement and the expansion as determined by the LeChatelier apparatus. Neither do the cements having the smallest percentages of free lime present give the best tensile strengths.

Judging from the above results it would appear that varying percentages of free lime, that is, from 0.34% to 1.68%, is not a factor in the short-time tensile strengths of portland cement.

Four-Month Test Results

For further comparative purposes four monthly average results are in Table II.

The above average monthly results on cement reveal no clue to the part played by free lime.

Below are given other results, each the average of fifteen or more samples of cement (Table III).

TABLE III—AVERAGE TEST RESULTS OF 15 CEMENT SAMPLES

Free lime	Fineness (200-mesh)	Expansion (mm.)	Tensile strength, 1:3 sand, lb. per sq. in. 24-hour	3-day	7-day	28-day
0.54%	84.0%	1.9	144	236	287	376
0.67	84.0	1.8	164	240	304	387
0.85	84.1	1.9	152	235	294	381
1.08	83.8	2.1	155	243	299	380
1.57	84.1	1.6	167	249	309	383

Stricter Free Lime Specification Not Necessary

It is hardly likely that the near future will find standard specifications permitting only a small percentage of free lime in portland cement as too many cements that would otherwise pass all the present specifications by a wide, safe margin, could not possibly meet specifications permitting only a few tenths of one per cent of free lime to be present. While it is, of course, possible to manufacture a cement containing only a few tenths of one per cent of free lime, the manufacturing cost makes it out of the question.

There is no doubt but that by finer grinding of the raw materials, more uniform chemical control of these mixtures, and harder burning of these mixtures in the kiln, the free lime content of the majority of portland cement can be kept at a minimum.

However, before cement companies are going to any great expense to meet these requirements it will be necessary for the chemist and engineer manufacturing and using portland cement to definitely show just what detrimental effect a few tenths of one per cent of free lime, or even one per cent, may have on the ultimate quality of concrete.

It is of course understood that free lime in concrete is one of the main causes for the deposition of efflorescence in concrete structures. It is also understood that the alkalies are also to blame for this occurrence.

For the present it remains to be shown just what effects the alkalies, the sulphides and free lime have in concrete.

Reaction of Water on Calcium Aluminates

THE Bureau of Standards has presented Research Paper No. 34 dealing with the reaction between water and calcium aluminates. In abstract the findings are:

The four calcium aluminates ($CaO \cdot Al_2O_3$, $3CaO \cdot 5Al_2O_3$, $5CaO \cdot 3Al_2O_3$, $3CaO \cdot Al_2O_3$) have been made, and the mechanism of their reaction with water has been studied. The tricalcium aluminate, $3CaO \cdot Al_2O_3$, reacted so rapidly with water that changes in the composition of the resulting solutions could not be followed. The other calcium aluminates, as well as a high alumina cement, reacted with water to form metastable and supersaturated monocalcium aluminate solutions in the early periods. The metastable solutions decomposed as the reaction proceeded with the precipitation of varying amounts of hydrated alumina and crystalline hydrated tricalcium aluminate, with attendant increases in both the pH and molar ratio, CaO/Al_2O_3, in the resultant solutions. The constitution of the aluminate solutions has been discussed. Calculations based upon electrometric measurements and chemical analyses indicate that the aluminate in solution is the calcium salt of monobasic aluminic acid. A study of the subsequent changes in the aluminate solutions, attended by increasing concentrations of calcium hydroxide, indicates that a hydrated tetracalcium aluminate may be formed in solutions where the pH value is greater than 12.0. An electrometric titration study of aluminum chloride and calcium hydroxide and an investigation of the calcium chlor-aluminates are described.

Is There Any Corrosive Quality in Slag?

IN THE NATIONAL SLAG ASSOCIATION'S Symposium No. 10, pertaining to the characteristics of slag, authorities are quoted to show that sulphur in slags is inert and they cite instance after instance to show that this rather old notion was absolutely unfounded. Attention is called to the fact that portland cement contains more sulphur than blast furnace slags and that this sulphur is in a more active form than in slags, yet portland cement has not been subjected to criticism on that account.

Similarly no authentic cases of deterioration of slag concrete made from portland cement or of rusting of steel embedded in such concrete could be found, according to the bulletin. Excerpts from various reports are given tending to show that steel imbedded in granulated slag, slag wool and crushed slag aggregates did not rust any faster than steel placed in other concrete construction materials and that in many cases the rate of rusting was less.

The bulletin can be secured from the secretary of the National Slag Association, Cleveland, at a cost of 25 cents.

Editorial Comment

The Lime Association

The national trade conference of the lime industry at Washington last week, held under the auspices of the Federal Trade Commission and the National Lime Association, was the snappiest and most business-like of any trade practice conference conducted thus far—given recognition as such by Commissioner Humphrey himself. The conference was the fruition of the past year's work of Norman G. Hough, the association's general manager. The resolutions or rules adopted are as comprehensive and as brief as any we have seen; but brief as they are they represent a thorough knowledge of the causes of many of the ills of the lime industry, and a determined attempt to approach them directly. The manner in which these resolutions were drafted, discussed, revised and adopted might well be followed in other rock products industries, for it involved a thorough house cleaning without wasting the commission's time or involving undesirable publicity.

Great credit is due the general manager of the association for the expeditious and thorough way the conference was prepared for and organized; and such credit was freely given, not merely by word of mouth but by electing him the president of the association; thereby departing from a time-honored custom of this and many similar trade and industrial associations of honoring electing a member producer.

A modern trade or industrial association is usually incorporated for specific purposes which require high grade business talent in management. But being modeled largely after our political institutions it has been the general custom to elect the nominal head from the active membership. With a live secretary or general manager, trade and industrial associations generally contrive, even under this system, to maintain a fair degree of business efficiency and constancy of policy; but after all, why model a business corporation after a political system which is notoriously inefficient? The interests of the corporation can be thoroughly taken care of by an active executive committee and a board of directors, and the head of the corporation should be their employe—as practically all large business organizations are now conducted.

The lime industry is to be congratulated on the progressive steps it has taken. It behooves every producer in the industry "to get on the band wagon"; and we believe after they have read the code of trade practices published elsewhere in this issue, and the new constitution of the National Lime Association, they will readily see that the present set-up of the organization means business.

Testing Sand

Much is still lacking in our nationally accepted sand specifications, but we are making progress in testing and in applying the results of testing to specifications. So far as grading and cleanliness go, there are grading or fineness modlus requirements in all states for highway concrete sands and there is a tendency for engineers tc use these as a standard for other work. It might not be a bad idea for national specifications to provide that in the absence of specifications applying to the particular work in hand the state highway requirements of grading and permissible silt or clay content should govern.

The strength test, the freezing and thawing test and the color test for organic matter are still open for discussion. There are good authorities who hold that the ordinary tensile strength test and the comparison with Ottawa standard sand show nothing of the concrete making value of a sand. At the same time this test would seem to be the simplest way to determine the effect of certain deleterious minerals. Lord has shown in his paper published in the January issue of *Public Roads,* how partially weathered feldspar in sand may seriously affect the strengths of mortar, so much so that there is a decided drop in strength from 7 to 28 days instead of the increase that is normal. Few laboratory men would care to report that this would happen from a minerological examination, and tests at 7 and 28 days would be more convincing. The effects of mica, shale and particles of sandstone would also be shown by the strength test.

The color test is unfair to those sands containing only traces of lignite; but lignite may be tested for and if it is present in quantities too small to affect mortar strength the color test may be discounted. As to the freezing and thawing test, which requires much work and a long time to make, if the conclusions of D. O. Woolfe, given in his paper in *Public Roads,* are correct, the abrasion test worked out at the Bureau of Public Roads will serve as well. For he has found that the resistance to freezing and thawing follows closely the loss by abrasion as shown by this test. It would be interesting to see some similar work done on coarse aggregates.

As this abrasion test also gives a definite criterion for hardness and durability the cycle of testing sands may be said to be closed. Much remains to be done by the specification making bodies and producers' organizations in checking and correlating and reviewing these tests. It may be some time yet before we have a satisfactory sand specification that can be used nationally; but the point is, we are advancing in our knowledge of testing sand and a satisfactory specification must follow.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	7- 1-29	91	.....	
Alpha P. C. new com.	6-29-29	44	46	75c qu. July 15
Alpha P. C. pfd.	6-29-29	116	.....	1.75 qu. June 15
American Aggregates com.[29]	7- 1-29	.....	44	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	7- 1-29	98	100	
American Brick Co., sand-lime brick	6-28-29	.....	13	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	6-28-29	.....	82	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]	7- 1-29	96	97	
American Silica Corp. 6½'s[49]	7- 1-29	96	100	
Arundel Corp. new com.	6-29-29	41⅞	42	50c qu. July 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	7- 1-29	70	80	
Atlas P. C. com.	6-29-29	45	47	50c qu. June 1
Beaver P. C. 1st 7's[29]	6-27-29	98	101	
Bessemer L. & C. Class A[4]	6-28-29	35½	36	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	6-28-29	95	96	
Bloomington Limestone 6's[39]	7- 1-29	90	93	
Boston S. & G. new com.[16]	6-29-29	20	22	40c qu. July 1
Boston S. & G. new 7% pfd.[16]	6-29-29	47	50	87½c qu. July 1
Canada Cement com.	6-28-29	26¼	26½	
Canada Cement pfd.	6-28-29	96	97	1.62½ qu. June 29
Canada Cement 5½'s[11]	6-28-29	98	100	
Canada Cr. St. Corp. 1st 6½'s[11]	6-28-29	95	99	
Canada Gyp. & Alabastine	6-28-29	108	109	75c July 2
Certainteed Prod. com.	6-29-29	23⅝	24½	
Certainteed Prod. pfd.	6-29-29	73	.....	1.75 qu. Jan. 1
Cleveland Quarries new st'k	6-28-29	69	70	50c Sept. 1
Columbia S. & G. pfd.	6-28-29	88	91	
Consol. Cement 1st 6½'s, A[42]	7- 1-29	92	95	
Consol. Cement 6½% notes[29]	7- 1-29	78	83	
Consol. Cement pfd.[29]	7- 1-29	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	5-17-29	101	103	
Consol. Rock Prods. com.[18]	6-28-29	8	.....	
Consol. Rock Prods. pfd.[18]	6-28-29	23	.....	
Consol. Rock Prods. units[20]	6-27-29	52	53	
Consol. S. & G. com. (Can.)	6-28-29	14	.....	
Consol. S. & G. pfd. (Can.)	6-28-29	86	88	1.75 qu. May 15
Construction Mat. com.	6-29-29	25	26½	
Construction Mat. pfd.	6-29-29	41	42¾	87½c qu. May 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	6-28-29	96	98	
Coosa P. C. 1st 6's[29]	7- 1-29	50	60	
Coplay Cem. Mfg. 1st 6's[40]	6-27-29	90	.....	
Coplay Cem. Mfg. com.[40]	6-27-29	10	.....	
Coplay Cem. Mfg. pfd.[40]	6-27-29	70	.....	
Dewey P. C. 6's[30] (1930-41)	7- 1-29	98	.....	
Dewey P. C. 6's[30] (1942)	7- 1-29	101	.....	
Dolese & Shepard	6-29-29	95	102	$2 qu. July 1
Edison P. C. com.[39]	6-29-29	10c	.....	
Edison P. C. pfd.[39]	6-29-29	25c	.....	
Giant P. C. com.[25]	6-28-29	34	38	
Giant P. C. pfd.[25]	6-28-29	34	38	3½% s.-a. June 15
Ideal Cement, new com.[33]	6-29-29	74	76	75c qu. July 1
Ideal Cement 5's, 1943[33]	6-28-29	100	102	
Indiana Limestone units[29] (5 shs. com. & 1 sh. pfd.)	7- 1-29	140	.....	
Indiana Limestone 6's	6-29-29	89½	90½	
International Cem. com.	6-29-29	83	85⅞	$1 qu. June 28
International Cem. bonds 5's	6-29-29	102	103¼	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	6-27-29	93	95	
Kelley Is. L. & T. new st'k	6-28-29	52¾	55	62½c qu. July 1
Ky. Cons. Stone Co. com.[45]	6-26-29	13	14	
Ky. Cons. St. com. Voting Trust Certif.[48]	6-26-29	13	14	
Ky. Cons. Stone 6½'s*[48]	6-26-29	96	100	
Ky. Cons. St. Trustee Certif.[48] (1 Sh. 7% cum. pfd. & 1 sh. com. stock)	6-26-29	99	102	
Lawrence P. C.	6-29-29	90	95	2% qu. June 29
Lawrence P. C. 5½'s, 1942	6- 5-29	91	94	
Lehigh P. C.	6-29-29	50½	53	62½c qu. Aug. 1
Lehigh P. C. pfd.	6-29-29	108	109½	1¾% qu. July 1
Lyman-Richey 1st 6's, 1932[13]	6-29-29	98	99½	
Lyman-Richey 1st 6's, 1935[13]	6-29-29	97	98½	
Marblehead Lime 6's[14]	6-27-29	98	100	
Material Service Corp.	6-29-29	29½	.....	50c qu. June 1
Medusa Portland Cem.[29]	7- 1-29	120	125	1.50 July 1
Mich. L. & C. com.[6]	6-17-29	35	.....	
Missouri P. C.	7- 1-29	41¾	42	50c qu. May 1
Monolith Midwest[9]	6-27-29	8½	10	
Monolith bonds, 6's[9]	6-27-29	97	98	
Monolith P. C. com.[9]	6-27-29	14	14½	40c s.-a. July 1
Monolith P. C. pfd.[9]	6-27-29	9	9½	40c s.-a. July 1
Monolith P. C. units[9]	6-27-29	32	33½	
National Cem. (Can.) 1st 7's[38]	6-17-29	96	.....	
National Gypsum A com.	6-29-29	16	18	
National Gypsum pfd.	6-29-29	52	55	
Nazareth Cem. com.[26]	6-27-29	26	29	
Nazareth Cem. pfd.[26]	6-27-29	100	104	
Newaygo P. C. 1st 6½'s[29]	7- 1-29	102	.....	
New Eng. Lime 1st 6's[14]	6-27-29	98	100	
N. Y. Trap Rock 1st 6's	6-29-29	96½	97	
North Amer. Cem. 1st 6½'s	6-29-29	71	72	
North Amer. Cem. com.[29]	6-29-29	9⅛	10	
North Amer. Cem. 7% pfd.[29]	7- 1-29	35	42	
North Amer. Cem. units[29]	7- 1-29	35	45	
North Shore Mat. 1st 5's[15]	7- 1-29	97	100	
Northwestern States P. C.[37]	6-27-29	125	.....	
Ohio River Sand 7% pfd.	6-28-29	101	.....	
Ohio River S. & G. 6's[16]	6-29-29	93	95	
Pac. Coast Cem. 6's, A[5]	6-27-29	.....	95	
Pacific Lime Co. pfd.[11]	6-15-29	No market		
Pacific P. C. com.	6-27-29	23	28	
Pacific P. C. pfd.[5]	6-27-29	78	86	1.62½ qu. July 5
Pacific P. C. 6's[5]	6-27-29	99¼	100	
Peerless Egyp'n P. C. com.[1]	6-27-29	2⅜	2¾	
Peerless Egyp'n P. C. pfd.[1]	6-27-29	80	85	
Penn-Dixie Cem. 1st 6's	6-29-29	85½	86	
Penn-Dixie Cem. pfd.	6-29-29	55	.....	1.75 qu. June 15
Penn-Dixie Cem. com.	6-29-29	13½	15⅝	
Penn. Glass Sand Corp. 6's†	6- 5-29	98	100	
Penn. Glass Sand pfd.	6- 5-29	108	.....	
Petoskey P. C.	7- 1-29	10	10¾	1½% qu.
Riverside P. C. com.[5]	6-27-29	18	20	
Riverside P. C. pfd.[5]	6-27-29	90	93	1.50 qu. May 1
Riverside P. C., A[9]	6-27-29	18	21	31¼c qu. May 1
Riverside P. C., B[44]	6-27-29	5	8	
Santa Cruz P. C. bonds	6-27-29	105¾	.....	6% annual
Santa Cruz P. C. com.	6-27-29	91	.....	$1 qu. July 1
Schumacher Wallboard com.	6-27-29	14½	15	
Schumacher Wallboard pfd.	6-27-29	23¾	25	
Southwestern P. C. units[44]	6-27-29	272	.....	
Standard Paving & Mat. (Can.) com.	6-28-29	31½	32½	50c qu. May 15
Standard Pav. & Mat. pfd.	6-28-29	96	96½	1.75 qu. May 15
Superior P. C., A	6-27-29	40¾	43	27½c mo. July 1
Superior P. C., B	6-27-29	22½	22¾	
Trinity P. C. units[37]	6-27-29	130	140	
Trinity P. C. com.[37]	6-27-29	40	.....	
Trinity P. C. pfd.[29]	7- 1-29	110	.....	
U. S. Gypsum com.	6-29-29	68½	70¾	2% qu. June 30
U. S. Gypsum pt. paid	6-29-29	60	61½	
U. S. Gypsum pfd.	7- 1-29	126	127	1¾% qu. June 30
Universal G. & L. com.[3]	7- 1-29	.....	1	
Universal G. & L. pfd.[3]	7- 1-29	.....	10	
Universal G. & L., V.T.C.[3]	7- 1-29	No market		
Universal G. & L. 1st 6's[3]	7- 1-29	.....	60	
Warner Co. com.[16]	6-29-29	35	38	50c qu. July 15
Warner Co. pfd.[16]	6-29-29	96	99	1¾% qu. July 1
Warner Co. 1st 6's[5]	7- 1-29	98¾	99	
Whitehall Cem. Mfg. com.[36]	6-28-29	150	.....	
Whitehall Cem. Mfg. pfd.[36]	6-28-29	98	.....	
Wisconsin L. & C. 1st 6's[15]	7- 1-29	98	101	
Wolverine P. C. com.	6-29-29	6	.....	15c qu. May 15
Yosemite P. C., A com.[20]	6-27-29	4¼	4¾	

*Ann. interest due May and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1. †Called for redemption at 105, July 1.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler Beadling & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Dillon, Read & Co., Chicago, Ill. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Peters Trust Co., Omaha, Neb. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co., of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher-Newton & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks. New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Inc., Los Angeles, Calif. [45]Taylor Ewart & Co. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd. (sand-lime brick) 13 sh.[6]	par 25	24
American Brick Co. pfd., 5 sh.[2] (par 25)	25	.....
Atlantic Gypsum Products[6] com., 200 shares	$2 per share	.....
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	.....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	.....
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....
Winchester Rock Brick Co., pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price at auction by R. L. Day & Co., April 24, 1929. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L. Day & Co., Boston, Mass. [6]Price obtained at auction by Wise Hobbs and Arnold, Boston, Mass., June 19, 1929.

Kelley Island Lime and Transport Earnings

EXTRACTS from the report of G. J. Whelan, president of the Kelley Island Lime and Transport Co., for the year ending December 31, 1928, follow (a preliminary balance sheet of this company for December 31, 1928, was published in ROCK PRODUCTS, April 13, 1929, p. 93):

The stock shares outstanding are no par shares, of which there are 308,952 issued, there being no relative change in the capital shares during the past year.

The net profit for the year 1928 amounted to $1,224,870.79, after deducting all expenses, depreciation, depletion, insurance and taxes, including provision for federal income taxes. There are no notes, bonds or other obligations outstanding, and quick assets are in such form that they may be immediately available for use to further the company's interests. Regular dividends of 62½c per share have been paid quarterly, and an extra dividend of 50c per share made a total of $3 per share paid to stockholders for the year; $295,781.66 was added to surplus for the year making the total surplus at close of business December 31, 1928, $3,673,337.69.

The net profit for the year 1928 was slightly less than for the previous year, due entirely to the lessening of building activities and the severity of competitive conditions caused by the coming into production of new plants in the finishing lime field which was already greatly overproduced. Demands for fluxing stone and commercial crushed stone have increased and are continuing satisfactory.

Depreciation and depletion charges have been continued at a proper rate, allowances for maintenance have been adequate to keep the properties in good condition for economic operation, and expenditures for improvements have been made as the requirements therefor became evident. The statement following gives the amounts expended for improvements together with the annual depreciation and depletion charges for the last five years.

Year	Additions and betterments	Depreciation and depletion
1924	$372,973.34	$289,630.55
1925	260,599.99	317,671.20
1926	351,322.22	294,351.37
1927	157,845.87	293,625.84
1928	520,468.22	295,128.99

The improvements made to the various properties during the year 1928 have included:

MARBLEHEAD—Construction of a new dock with storage bins, conveyors and loading equipment to permit shipping commercial crushed stone by boat. This dock was completed during the summer of 1928, a large part of the work being done by the company's own organization in a creditable and economical manner, and has already enabled us to dispose of large quantities of stone that cannot be shipped by rail because of prohibitive freight rates. The general plans were made to allow for easy extension of the dock and loading equipment out to deep water for handling the largest lake vessels in case of developments that would make such an extension advisable, and there are possibilities that the dock may have to be extended at an early date to take care of the growing demands for lake transportation of stone.

Electrical equipment has been installed at Central Plant to change from 25- to 60-cycle power.

Construction of a new locomotive house, near the present crushing plant, was started and well under way before the end of the year. This improvement was made necessary by the condition of the old engine house and the expiration of the James Lease. Certain economies have been effected that will make the investment a paying one in itself.

KELLEY'S ISLAND—A new caterpillar type steam shovel was purchased for use in quarrying stone.

WHITE ROCK—A new caterpillar type revolving steam shovel was purchased for the more efficient handling of stripping. New machinery was installed in one of the hydrate mills.

GIBSONBURG—Static condensers, etc., were installed to improve the power factor and lower the cost of power purchased.

ROCKPORT—A complete new crushing, screening and washing plant was built to permit making a quality of commercial crushed stone that will pass the rigid specifications now imposed upon this product.

BUFFALO—New equipment was purchased and installed to make finely ground quick lime, a new product, to meet certain trade requirements.

SANDUSKY—The activities of this department were enlarged by the purchase of the Anchor Sand and Gravel Co. business at Erie, Penn. This property has been improved by addition of modern equipment.

DOVER PLAINS—The six lime kilns comprising the original plant purchased from the Dutchess County Lime Co. several years ago were in such condition that it was necessary to tear them down and completely rebuild them. The work was completed in November, 1928.

Many minor expenditures were made during the year at all plants for equipment and other improvements to increase efficiency and lower the costs of finished products.

The year 1929 will see the beginning of many more improvements to the physical properties. New locomotive cranes have already been purchased for Marblehead and Erie; installation of equipment to enable us to wash commercial crushed stone at Marblehead is under way; new pumping equipment has been purchased for White Rock and Huntington to permit lowering the quarry floor levels; the installation of new stone crushing equipment has been completed at Gibsonburg, and a new hydrate plant has been started at Marblehead to replace a patented system installed a number of years ago and which has proven that it is not adapted to produce the quality of product demanded by the trade. The Steamer *McKerchey* has been improved by adding self-unloading equipment.

Up to date this year (May 15), demand for the company's lime products in the building industry has decreased, due to the falling off of building activities in many parts of the country. Industrial demands for lime products are increasing and offset in some measure the lower building demands. Production of fluxing stone for the steel trade is at a high peak and should continue so throughout the year. Diversification of business is continuing to prove that the company will be able to maintain its strong position even though the market for building materials is less active.

BALANCE SHEET DECEMBER 31, 1928, OF THE KELLEY ISLAND LIME AND TRANSPORT CO.

ASSETS

Current:		
Cash	$ 461,484.55	
U. S. Liberty bonds	2,547,685.74	
Notes and accounts receivable	543,482.99	
Inventories	622,177.90	
		$4,174,831.18
Investments in stock and bonds and accrued interest		606,590.37
Other investments		34,020.92
Permanent investment in land, buildings and equipment		6,855,632.41
Investment in subsidiary companies		403,372.00
Notes and accounts receivable in subsidiary companies		5,038.06
Insurance reserves		301,220.21
Deferred:		
Prepaid taxes, unexpired insurance, etc.		22,792.95
		$12,403,498.10

LIABILITIES

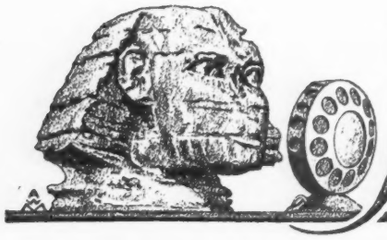
Current:		
Notes and accounts payable	$127,708.05	
Dividends payable, January 2, 1929	347,571.00	
Income tax accrued, estimated	175,838.39	
Taxes accrued	51,964.05	
Liability insurance accrued	2,058.71	
		$705,140.20
Insurance reserves		301,220.21
Capital stock (no par)		7,723,800.00
Surplus		3,673,337.69
		$12,403,498.10

INCOME AND EXPENSE FOR YEAR ENDED DECEMBER 31, 1928

Operating profit	$1,601,271.96
Selling, executive and general expense	318,900.02
Net operating profit	$1,282,371.94
Other income	115,545.25
Profit before providing for income tax	$1,397,917.19
Provision for income tax	173,046.40
Net profit	$1,224,870.79

Dividends Announced

Alpha Portland Cement com. (quar.)	75c, July 15
Alpha Portland Cement pfd. (quar.)	1¾%, June 15
Arundel Corp. com. (quar.)	50c, July 1
Boston Sand and Gravel com. (quar.)	40c, July 1
Boston Sand and Gravel pfd. (quar.)	87½c, July 1



Hints and Helps for Superintendents

Shooting Granite at the Quarry of the Saluda Crushed Stone Co.

THE quarry at Saluda, S. C., which is operated by the Saluda Crushed Stone Co., presented an interesting blasting problem as the stone did not give the desired fragmentation when shot by the methods used by the other granite quarry operators in that vicinity. The usual practice in North and South Carolina is to drill holes from 15 to 20 ft. center to center with a similar amount of burden, variations being according to local conditions, and shoot with gelatine dynamite of strengths of 40 to 75%. Some operators use both percentages in the same hole and in practically all cases these holes were detonated with Cordeau Bickford.

Well-shattered stone, clear of the face as a result of a typical shot

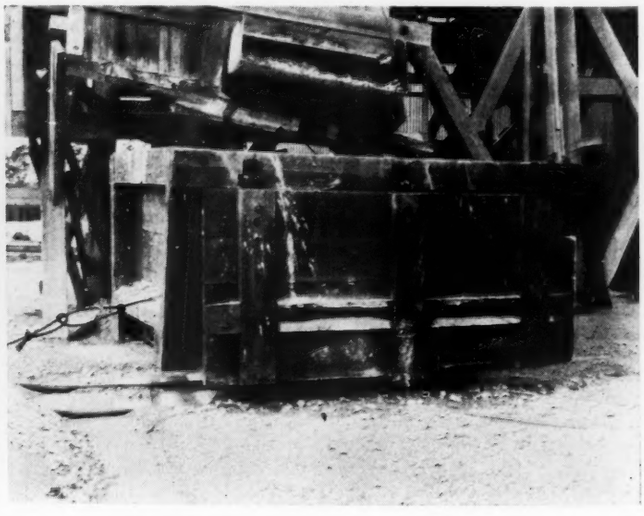
W. H. Cook, president of the Saluda company, was not satisfied with the results he was obtaining in the quarry so experiments were conducted in co-operation with the Grasselli Powder Co. The highest tonnage of stone per pound of explosive was obtained and excellent fragmentation was secured by loading every other hole with 75% gelatin dynamite while the intervening holes were loaded with 40% gelatin dynamite. The holes are drilled on 30 ft. centers with a 20 ft. burden and the powder charges are placed in the holes in quantities based on a breakage of 5 tons of granite per pound of explosive. The accompanying picture shows the result of such a shot, the stone being well shattered, broken clean and thrown well away from the face.

Stock Pile Storage Car

MOST of the crushed stone produced at the Brooksville, Fla., operation of Florida Crushed Stone Co. is loaded direct to cars but it frequently is necessary to resort to stock piling to insure continuous operations.

The car used is hopper-bottomed, with side discharge, the doors being tripped by a tripper which can be fastened to the rails at any desired point over the stock pile. The car of stone is pulled up the incline by a suitable hoist, discharged and returned by gravity to the bin for reloading. Very often the door does not catch properly and as the car is loaded by an operator on an elevated platform who also supervises the loading of railway cars for shipping, it would be very inconvenient for him to have to leave his station. As a positive method of closing this door before loading a wheel is mounted beside the incline, as shown, and as the car passes this wheel sufficient pressure is exerted against the door to close and latch it.

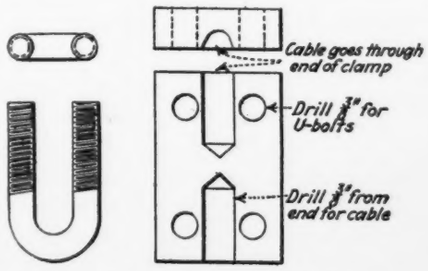
The wheel closes car door as it goes by



The car with door closed ready for loading

Tight-Gripping Wire Rope Clamp

IT IS NOT ALWAYS possible to clamp tightly the wire ropes on mine cages, skips or cars with a single clamp. The clamp, illustrated herewith, is designed in one unit although really two clamps, according to R. M. Thomas, writing in the *Engineering and Mining Journal*. The advantageous feature of having one plate holding two U-bolts can easily be seen. The rope will be raised up between both bolts, which will act as a lock on both sides of each bolt.



Rope clamp comprising a plate and two U-bolts

By drilling the plate ⅜ in. in diameter, and 1⅛ in. deep (place two plates together to do this), leaving the center solid, the cable can be clamped into these drilled slots and raised up ¼ in. in the center. This will prevent it from slipping. This clamp is designed for ⅜-in. cable, but can be made in all sizes. It should be made of good steel. Lock washers should be used on the nuts.

Shifting Pit Tracks with a Tractor

SHIFTING track in quarries and gravel pits is always an expensive proposition, whether the work is done by modern machinery or by the old fashioned "strong back" method. An interesting arrangement has been put into service by the Northern Illinois Coal Corp., at its large strip mine near Wilmington, Ill., for changthe location of its trackage. A special hydraulic lift has been installed on the rear of a "Caterpillar" tractor, and with this the track is partially lifted from its position, while a forward or backward movement of the tractor shifts the track to the new location. The illustration shows the work in progress.

Tractors used to change track location

A Use for Abandoned Shovel

THE early operators at the Camoa quarries at Jamaica, near Havana, Cuba, attempted to load limestone for commercial aggregate with steam shovels, but owing to the fact that the stone is a very porous material mixed with a cherty limestone, to say nothing of clay, it was impossible to secure a grade of stone that could be successfully washed at the plant built for that purpose,

Abandoned shovel serves as car spotter

so the use of this type of shovel was abanboned and hand loading resorted to.

As the shovels were "left-overs" when the present management took charge of the company's affairs, one of them was put to work to serve as a car spotter. This was accomplished by removing the boom and dipper stick and using one of the hoisting drums, fitted with a cable, for this work.

The erstwhile shovel was backed into a cut at the end of the track and the operator was protected from the glaring tropical sun by a makeshift cover of pieces of corrugated iron. As the shovel had been in its new setting only a comparatively short time, vegetation had not collected to any great extent, but no doubt in another year tropical vines will completely envelop the whole machine, making a more sightly setting than the present.

Find That Lost Churn Bit

THERE probably is nothing more aggravating to a quarry operator than to have a churn drill stem stick or to lose one in a deep hole for any reason. Still worse is to have a shovel root into one end of a lost drill after a shot and, before the operator realizes what is going on, to bend the stem in attempting to free the bucket. Likewise

Metal marker indicate problable position of lost bit

it is aggravating to the owners when they do not recover the bit at all, leaving it covered by a chance pile of stone.

To forewarn the shovel operator of a condition of this kind, every spot where a stem, bit or both has been lost should be marked. At the Marble Cliff quarries, Columbus, Ohio, a standard metal sign, as shown in the accompanying view, is used to mark the spot.

Standard Trap Rock Corporation Wins Right to Operate Plant

THE United States district court, southern district of New York, has recently granted an injunction restraining the board of commissioners of the Palisades Interstate Park (New York) from interfering with the operations of the Standard Trap Rock Co. This company's new plant at Piermont, N. Y., completed late in 1928, has never operated, for the park commission served notice at that time that the property had been appropriated for state park purposes and since this entry has maintained in possession of the property with a patrolman on guard. A complete description of the plant was published in ROCK PRODUCTS, November 24, 1928, along with some of the details concerning this interesting case.

The court's decision was based partly on a distinction between acquiring land by condemnation and by entering and appropriations. The right of the Palisades Park commission to acquire land by the latter method was denied by the court, which quoted the statute creating this commission and its powers. The court held that, according to chapter 241, laws of 1928, land may be acquired only under the sections of the law of 1900 if payment is to be made from funds appropriated by chapter 16 of the laws of 1926. That chapter made specific appropriations for the acquisition of land by condemnation proceedings. Substantial rights were affected in the case by the unlawful entry and appropriation, for the moment notice of appropriation was served it divested the owners of title and in this instance limited them to part of the $600,000 appropriated the commission. If the land were condemned, the owner would have full ownership and hold the fee until the land was fully paid for.

Further, the court stated that under chapter 242, laws of 1928, it was necessary to complete condemnation proceedings within 18 months after the first publication and notice of application to condemn, which, in effect, limited the time of payment. The section also required a report of the amount of money awarded the owner of the land.

This chapter (242) was held to be in direct conflict with the referendum act and of no force or effect in the absence of funds separately appropriated, and the Palisades Park commission had no power to acquire, by entry or appropriation, lands which must be paid for out of bonds appropriated by the 1924 referendum. Further, the court ruled that no payments having been made within the two years after the passage of chapter 16, laws of 1926, the entry and appropriation of the lands in question was unlawful. This taking of private property for public use without just compensation was contrary to the 14th amendment as well as the state constitution. An award of the Court of Claims without an appropriation creates no right of payment out of the treasury, the court stated.

The history of the case is as follows: On June 11, 1927, the Standard Trap Rock Corp. and Sparkhill Realty Corp. (owners of the land) were served notice that the board of commissioners, Palisades Park commission, had adopted a resolution to take preliminary steps toward the acquisition of their property for park purposes. The board in a letter (October 14, 1927) stated that they had received the company valuation and had instructed its counsel not to take any steps for the condemnation of the property. The Standard corporation therefore proceeded in its plans for the development of the quarry, which had been held in abeyance since the notice of June 11, 1927. During the period between October 18, 1927, and October 11, 1928, the company erected its plant. On that day the park commission filed a notice of appropriation for park purposes and stationed a guard at the plant.

There was also a wide divergence in the estimation of the value of the plant and property. Several affidavits placed the valuation of the quarry property and plant at $4,000,000. The commission held that their experts reported it to be worth less than $600,000. One commissioner stated that the property as of October 14, 1927, was unimproved and assessed for taxing purposes at $15,000.

The property is owned by the Sparkhill Realty Corp. and comprises 113 acres of upland and 57 acres of marsh land. Under the terms of the lease, the Standard corporation must pay as a minimum $35,000 per year, the lease being fixed at 7 cents per cubic yard up to 500,000 cu yd., 6 cents per cubic yard in excess of this up to 600,000 cu. yd., and 5 cents per cubic yard on all over the latter figure. It is maintained that the income of the lease would be about $80,000 annually. The Standard corporation valued its plant and machinery at $1,000,000 and estimated that income to be derived from operations would be $500,000 per year.

California Stucco Products Completes New Plant

THE NEW plant of the California Stucco Products Co. at Los Angeles has been completed, according to the *Los Angeles Times*. The building, of Spanish design, is 147x138 ft. in dimensions, with a two-story section and basement. It provides nearly three times the floor space of the firm's former home at 16th and Alameda streets.

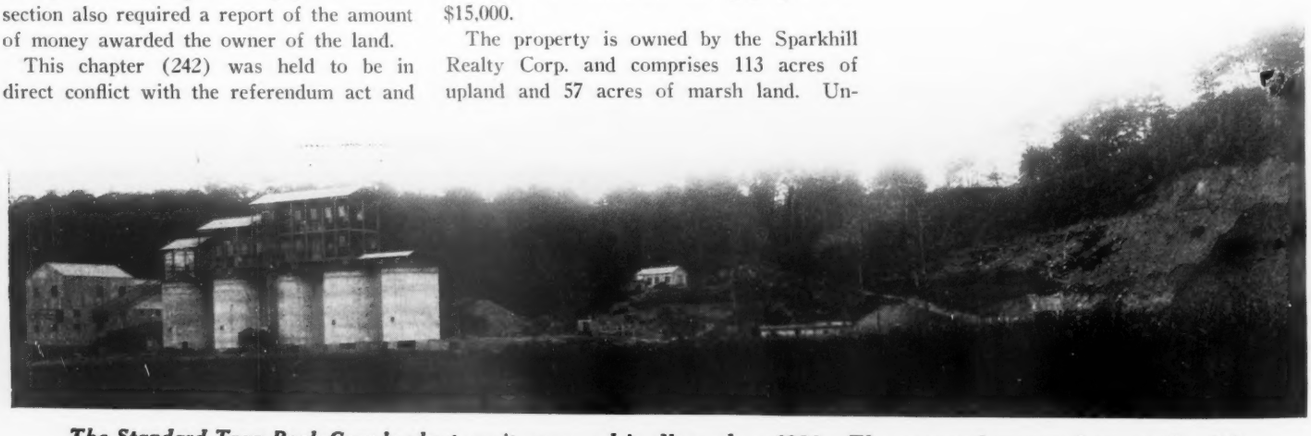
Approximately 18,000 sq. ft. of factory area is now available, besides ample space for sample rooms, display rooms, testing laboratories, storage and shipping rooms. The second floor is for general offices.

In designing the new plant careful attention was given to the efficient handling of materials. Three large loading doors and a basement chute face the spur track running the length of the building. A depressed loading bay facilitates the loading of trucks.

The new structure was erected at a cost of approximately $100,000 and was completed within 45 days. The Austin Co. of California were the engineers and builders.

Fluorine from Fluorspar by Electrolysis

FLUORINE, the gaseous chemical element, heretofore isolated in only small quantities, has been produced electrolytically in 1,000-cu. ft. quantities, by Professors Wilder D. Bancroft and Newton C. Jones, of Cornell University. As a result, a new method of analyzing organic compounds will be developed.—*Science.*



The Standard Trap Rock Corp.'s plant, as it appeared in November, 1928. The proposed quarry shows at the right

Annual Meeting, American Society for Testing Materials

Radical Changes in Cement Specifications Proposed— Report of Admixtures Committee Creates Wide Interest

By P. J. Freeman
Chief Engineer, Bureau of Tests and Specifications, Allegheny County, Pennsylvania

THE THIRTY-SECOND annual meeting of the American Society for Testing Materials at Atlantic City, N. J., on June 24-28, inclusive, showed a registered attendance of 926. There were 15 general sessions of the Society and a multiplicity of committee meetings some of which extended long past midnight. Simultaneous sessions were held at which an endeavor was made to group those subjects which were closely allied. Approximately 100 papers and committee reports were presented, many of which were of outstanding importance to particular industries, but in this report of the proceedings, only those papers which are of especial interest to readers of ROCK PRODUCTS, will be discussed.

Report of Cement Committee

Committee C-1 on Cement—P. H. Bates, chairman, reported the establishment of a reference laboratory which is a project unique in the history of the American Society for Testing Materials. The 70th Congress appropriated $12,500 for the U. S. Bureau of Standards to establish a reference laboratory plan and the Portland Cement Association had previously appropriated a similar amount to match the government appropriation. The general outline below indicates the scope of the work to be done by this reference laboratory. Other details will be worked out as the plan develops. The committee report follows:

Establishment of Reference Laboratory

"Establish at the U. S. Bureau of Standards at Washington, a fellowship to be known as 'Cement Reference Laboratory' for standard cement testing. Under this fellowship, establish a laboratory with apparatus and personnel capable of making tests of portland cement in strict conformance with the standard specifications and tests of the A. S. T. M. The work will be confined to physical testing.

"This laboratory staff to be prepared to instruct on established methods of making tests and proper methods for maintaining testing equipment, also to calibrate testing equipment submitted by purchasers or by manufacturers of such equipment.

"This laboratory staff to make at the request of the directing head of a cement testing laboratory, report upon the adequacy and accuracy of its apparatus to make cement tests conform with the standard specifications. Suitable certificates covering the apparatus only will be issued to laboratories entitled to them.

"To make upon request, tests of cement for the purpose of enabling a laboratory to check its results with those of the reference laboratory. It will be desirable to limit such check tests to cases where the apparatus in the outside laboratory has been inspected and certified as correct."

Certification of Apparatus

It was especially emphasized that although certificates will be issued covering the apparatus found in laboratories throughout the country no certificates will be issued which will refer to the ability of the operators in a given laboratory to perform the testing of cement in a creditable manner or in any way reflect favorably or otherwise on the personnel of a given laboratory.

In addition to its general educational work in establishing a wider understanding and better use of standard methods in cement testing the laboratory will, as time and means permit, study the effect of variations in time of performing the different operations involved in standard cement testing, reporting the results to Committee C-1 in an effort to improve the concordance of results obtained in cement testing.

The new reference laboratory will be installed in the Industrial Building of the Bureau of Standards, Washington, D. C. J. R. Dwyer, who will be in direct charge of the laboratory, has been connected with the Bureau of Standards for about 10 years and is well equipped both by training and personality to have charge of this work. Every facility will be provided for maintaining standard conditions where these are specified, and ideal conditions otherwise. The laboratory will be equipped so far as possible with all satisfactory testing apparatus now available on the market.

Instruction by Competent Staff

The instruction to be given by the laboratory staff will be of two classifications (1) in Washington and (2) in the field.

(1) In Washington detailed instruction will be given in the making of test specimens and in the methods of testing. Instructions will also be given in the maintenance of testing equipment and in checking the calibration of equipment.

(2) In the field the instruction will consist principally of criticism of methods and conditions noted in each laboratory visited, and suggestions will be given for improving them. At the same time testing equipment in the laboratory visited will be calibrated where possible and instruction given in proper maintenance of equipment.

The service will be available upon application only and will be rendered as nearly as possible in the order in which the applications are received. Instruction in Washington may be expected to occupy two or three weeks, depending upon the aptitude of the men sent for training.

The schedule of the laboratory representative giving instruction in the field must obviously be arranged by routes to avoid unnecessary traveling. A couple of days only can be allotted to each laboratory on each visit.

It is the intention of the laboratory to calibrate tension testing machines, scales, balances, needles, briquette molds and sieves. Tolerances for sieves have already been fixed for Committee C-1 and tolerance for other pieces of apparatus are now being suggested and brought out for the approval of the committee.

Certificates will be issued to manufacturers of apparatus of the classification for which the reference laboratory proposes to issue certificates so that the users may purchase calibrated and certified apparatus. Such apparatus as well as that submitted by users will be tested when sent to Washington and a nominal fee charged for service.

Undoubtedly all manufacturers of cement testing equipment will be greatly

interested in this calibration and standardization and it will be a great assistance to laboratories desiring to purchase new types of equipment. In the past the design and operation of testing machines for cement has been largely in the hands of the manufacturers who followed loosely the requirements laid down by Committee C-1. It has been the writer's experience that some of this apparatus was not suitable for accurate or routine testing, and no doubt many other laboratories have had the same experience and they will appreciate the services which can now be furnished by the reference laboratory.

Fees charged for calibrating such apparatus will be in accordance with the regulations of the Bureau of Standards and such fees must be transferred to the Treasury Department and they will not be available for expenditure by the reference laboratory. There will be no charges for services rendered in the field to users.

The funds contributed by the industry will be paid at intervals into the treasury of the Society and monthly reports from the reference laboratory will be made to the American Society for Testing Materials.

The staff will consist of a chief and four assistants and the Bureau of Standards is now assembling personnel and apparatus and it is thought that the laboratory will be ready to give service about the first of August. Application for service should be made to the Cement Reference Laboratory in care of the Bureau of Standards, Washington, D. C.

Outline Plastic Mortar Tests

Committee C-1 also presented a tentative outline of test procedure for cooperative plastic mortar tests. This report covers an outline of that procedure so that the laboratories participating in the tests shall have their attention focused on the evaluation of the plastic mortar compression tests with two main objects in view.

(a) To find out whether a given laboratory using its local aggregates of known good quality, can obtain a reasonable agreement between concrete strengths if the procedure is followed as outlined.

(b) To find out whether a definitely specified mortar test of different cements with Ottawa run-of-mine sand will give reasonably concordant results in different laboratories.

The outline covers five pages of closely printed instructions and cannot be reviewed at this time.

Proposed Changes in Cement Specifications

Committee C-1 held three separate meetings most of the time of which was spent in discussing proposed changes in the standard specifications for portland cement, and the formation of a new specification for high-early strength portland cement. The nature of the changes proposed and the new specifications for high-early strength portland cement were not presented to the general session of the Society and have not yet been released for publication as the report is still in the hands of Committee C-1. In reporting to the general meeting of the Society it was stated that it is proposed to test ordinary portland cement at earlier periods than called for under the standard specifications and that the 28-day strengths should show no retrogression over that obtained at 7 days.

The proposed changes in standard specifications and the new proposal for high-early strength portland cement will be sent out for letter-ballot of Committee C-1 and if accepted as a tentative specification it may be available for publication sometime this fall. In view of the fact that cement products produced in this country annually have approximately twice the value of all the pig iron produced during the same period, those having interest in portland cement and its products will look forward to the report of Committee C-1 with an unprecented desire to learn the final results of the deliberations of that committee. At no time during the writer's connection with the A. S. T. M. has there been such outstanding developments in the work of Committee C-1 at any one meeting, and the activity is to be greatly commended.

Concrete and Concrete Aggregates

Cloyd Chapman, chairman of Committee C-9, reported to the general society that a number of revisions were recommended in "Standard Methods of Making and Storing Concrete Specimens in the Field," C 31-27. These changes refer to methods for obtaining samples of concrete in the field, time of capping specimens after molding, and to definitely differentiate between methods of handling and curing specimens which are intended for laboratory control tests from those specimens which are intended for field control tests.

Those specimens which are intended for laboratory control shall be placed under moist curing conditions at the end of 24 hours and so maintained until tested. Specimens intended for field control tests shall be kept on the structure and receive the same protection on all surfaces and in all respects as that portion of the structure which they represent. Field specimens shall be sent to the laboratory not more than 7 days prior to test and maintained in ordinary room temperatures until tested.

These changes were accepted and will be published as Tentative Revisions of the Standard Specifications.

Committee C-9 has approximately 93 separate projects under investigation and various members of the committee have been assigned to report on a particular project. This method of working has recently been adopted by this committee and the results so far obtained indicate that it is an effective one.

Effect of Stone Dust on Properties of Concrete

An appendix to the report of Committee C-9 contains a digest of the report on "Effect of Stonedust on the Properties of Concrete," by A. T. Goldbeck. This report briefly summarizes a series of tests to determine what extent dust-coated stone affects the properties of concrete. A special wearing device had been devised by Mr. Goldbeck and used in the laboratory of the National Crushed Stone Association at Washington, D. C.; this device produces very rapid wear on the surface of a concrete specimen and may be used on pieces of broken beams or similar small surfaces of concrete.

The conclusions from these tests were given as follows:

That the decrease in modulus of rupture due to dust is from 1 to 1½% for each increase of 1% in dust.

That the decrease in crushing strength is from 0 to 2% per cent for each increase of 1% in dust up to the limit of 5.7% of dust used in these tests.

That dust up to 5.7% by weight of stone did not cause any serious decrease in the resistance to wear of the concrete.

The report of the Committee on Admixtures lists nearly all of the various admixtures which are being sold in this country and wherever the information was furnished by the manufacturers this report includes a statement of the chemical and physical qualities of each admixture. The committee takes no responsibility for the correctness of these statements but they have summarized within a few pages a great deal of information concerning some of the well-known admixtures.

Flat Particles in Concrete Mortars

An appendix to the report by Stanton Walker and C. E. Proudley gives the results of tests made to determine the effect of flat particles on concrete making properties of gravel. These tests were carried out in the research laboratory of the National Sand and Gravel Association, Washington, D. C. The report gives the results of a number of miscellaneous tests which show the effect of flat particles on the compressive and flexural strength of concrete and also includes studies of the surfaces of concrete slabs and the physical characteristics of the aggregate.

The authors draw the following conclusions from their tests:

Gravel consisting of flat particles showed a higher percentage of wear in the Deval abrasion test than gravel made up of round

particles. This can be accounted for to a considerable extent by the impact action of the cast-iron balls added as an abrasive charge.

For the conditions of these tests the percentage of wear increased approximately in direct proportion to the percentages of flat particles.

For gravel graded from ¼- to 2¾-in., 10% of flat particles caused no decrease in compressive or flexural strength in a 1:2:3½ mix.

For gravel graded from ¼- to ¾-in., 14% of flat particles caused no decrease in compressive or flexural strength in a 1:2:2¼ mix.

Observations of the surface texture of various finished slabs made with ¼- to 2¾-in. gravel, containing 15% of flat particles, indicate that, in a road slab, the flat particles would not have a tendency to float to the surface or arrange themselves in such a way as to be readily broken out by traffic. These slabs and field observations indicate that there would not be an undue amount of pitting due to flat particles of a sound and durable nature.

Effect of Coal and Lignite in Sand Used for Concrete

Appendix II of the report gives the results of tests made by the Allegheny county department of public works laboratory on the effect of coal and lignite in sand for concrete. These tests represent approximately 172,000 tons of sand, of which only 2000 tons would have been accepted under the ordinary colorometric requirements. Of 340 tests from barges only four indicated no color. Strength tests on a 2x4-in. cylinders made on samples showing color as represented by plates 1, 2, 3 and 4 did not indicate any reduction in compressive strength for the darker colors, but the sands showing color did have a somewhat lower strength ratio than those sands which had no color at all.

All of the 17 committees showed activity in their particular fields and more extensive reports are promised for future meetings. Particular interest will be manifested when the sub-committee on the curing of concrete has completed its work which is now well under way in cooperation with the association of State Highway Officials and the Highway Board of the National Research Council.

Road and Paving Materials

Committee D-4, R. W. Crum, chairman, presented a new tentative specification for portland cement concrete for pavements and bases. This specification has been developed in co-operation with the American Concrete Institute, the American Association of State Highway Officials and Committee C-9, and was published as information in the proceedings of the committee in 1928. Unfortunately this specification failed to obtain the approval of the general session of the society at which it was presented and it is therefore dropped from the committee report of this year.

Committee D-4 proposed for advancement to standard the following specifications:

1. Tentative Specifications for Sand for Sheet Asphalt and Bituminous Concrete Pavements (D 162-23 T).
2. Tentative Specifications for Broken Stone for Water-Bound Macadam Surface Course (D 191-24 T).
3. Tentative Specifications for Broken Stone for Bituminous Macadam (D 192-24 T).
4. Tentative Specifications for Broken Stone for Bituminous Concrete Surface (D 194-24 T).
5. Tentative Method of Test for the Determination of Moisture Equivalent of Subgrade Soils in the Field (D 220-25 T).

These specifications have been published as tentative for some time and now become standards of the society.

New Specifications for Gravel in Bituminous Concrete Base

A new specification was proposed as tentative for gravel for bituminous concrete base.

The deleterious substances shall not exceed the following maximum requirements:

	Per cent by weight
Removed by decantation	1
Shale	1
Coal	1
Clay lumps	0.5
Soft fragments	5
Total shale, coal, clay lumps and soft fragments	5
Other local deleterious substance (such as alkali, friable, thin or elongated or laminated pieces).	

The grading of the gravel when tested by means of laboratory screens shall conform to the following requirements:

¼- to 1¼-in. size	Per cent
Passing 1½-in. screen	100
Passing 1¼-in. screen..not less than	95
Passing ¾-in. screen.....40 to	75
Passing ¼-in. screen..not more than	5

¼- to 2½-in. size	Per cent
Passing 3-in. screen	100
Passing 2½-in. screen..not less than	95
Passing 1¼-in. screen.....40 to	75
Passing ¾-in. screen.....10 to	25
Passing ¼-in. screen..not more than	5

Tentative Specifications for Broken Stone for Water Bound Base D190-24-T—percentage of wear raised from 7 to 8.

A third size of aggregate was added ranging from 2½- to 4½-in. Specifications are as follows:

	Per cent
Passing 2½-in. screen	0 to 15
Passing 4½-in. screen	95 to 100

Tentative Specifications for Broken Stone for Bituminous Concrete Base, D193-24T. Requirements for percentage of wear under this specification were increased from 6 to 7, and the specification continued as tentative.

Changes were made in the various standard Specifications for Granite Block D59-26; D131-23, which will require the use of a press to break fragments for the abrasion test into pieces of nearly cubical as possible. This change was made in order to obtain more reliable test percentages of wear, and was recommended for publication as tentative.

Lime and Gypsum

The lime committee, of which H. C. Barry is chairman, recommended advancement to standard the chemical analyses of limestone, quicklime and hydrated lime and the recommendations of the committee were approved. The chairman further reported the development of a sectional committee to draw up specifications for plastering.

J. W. Ginder, chairman of committee on gypsum, reported progress in the studies of gypsum and anhydride mixes in portland cement and volume changes in gypsum, and completion of investigation on properties of gypsum fibre concrete. The committee recommended revision of tentative specifications for Keene's cement and also calcined gypsum for preparation of dental plasters.

The recommendations for the adoption of standard specifications for gypsum molding and pottery plasters were accepted at the general session.

Symposium on Mineral Aggregates

Two sessions of the Society were devoted to a symposium on mineral aggregates which served to assemble a wide variety of valuable information into one paper. In view of the fact that this symposium covers 122 pages of tables and text it will be practically impossible to even briefly summarize the valuable information presented. Some of the more important papers will be published in later issues of Rock Products.

Inspection of Aggregates

R. W. Crum, director, Highway Research Board, National Research Committee, commented on the fact that aggregates are among the most difficult materials to inspect fairly. He stated that it was easy to write specifications for ideal material and then accept shipments in perfect compliance therewith, but it is better engineering and better economy to devise methods for using the general run of aggregates in a locality and then inspect shipments in a reasonable way so as to be fair at all times to both producer and consumer.

A. S. Rea, chief engineer, bureau of tests, Department of Highways, discussed general methods of inspection under the following topics:

Preliminary investigations, including material surveys.

Inspection during construction, including

inspection at source of supply and destination.

Methods of sampling.

Field tests.

It was stated that about 90% of all aggregates are inspected at destination. This is due to the fact that the inspection of such materials lend themselves better to visual inspection and also to the fact that field tests are more adaptable to aggregates than other classes of material.

The speaker called attention to the standard method for sampling stone, slag, gravel, sand and stone block for use as highway materials, A. S. T. M. Standard D75-22, and stated that experience has demonstrated that these methods are satisfactory and practical.

L. E. Williams, Ray Sand and Gravel Co., called attention to some tests which had been made in Detroit in connection with the University of Michigan in which materials were sampled at point of production and at various intervals until they were finally ready to be placed into the mixer. The test indicated the degree of segregation so great that the original grading of the materials had been practically lost.

Fine Aggregates in Concrete

H. F. Gonnerman, manager, research laboratory, Portland Cement Association, traced the history of specifications for sand from those written by Ditrivius, the Roman architect, of about 25 B. C. down to the present date. It was interesting to note that Mr. Ditrivius was having trouble with his sand even at that early date. Among other specifications, Ditrivius stated that "the best will be found to be that which crackles when rubbed in the hand. Throw some sand upon a white garment and then shake it out; if the garment is not soiled and no dirt adheres to it, the sand is suitable." The writer is very much afraid that some of our present-day sands would not meet this specification with the white garment.

Mr. Gonnerman called attention to the various researches which have been made on fine aggregates and gave reference to many sources of such information. Attention was called to the fact that there is a tendency to liberalize permissible gradings with the exception of the necessary fine material to obtain workability.

Mortar and Plaster Sands

J. C. Pearson, assistant to chemical engineer, Lehigh Portland Cement Co., called attention to the lack of information necessary for writing specifications covering sands to be used for plastering. He stated that the application of the so-called plastic mortar test indicated that this is a safeguard against dangerous sands and that poorly graded or excessively fine sands are uneconomical. Mr. Pearson rated the following properties of ordinary mortars and plasters in accordance with their desirability: Plasticity; volume change; content of water soluble material; strength.

It will be noted that the author put plasticity at the head of the list as the most desirable property and strength as probably the least necessary requirement.

Fine Aggregates in Bituminous Mixtures

Hugh W. Skidmore, president, Chicago Paving Laboratory, submitted a paper, "Fine Aggregates in Bituminous Mixtures, Including Fillers," in which was pointed out the advantages of shearing tests as a method for determining the stability of paving mixtures made of fine aggregates. He stated that there was a vast difference in stability of different aggregates. Porous aggregates, even very soft limestone, show much higher values than sand, with crushed granite intermediate. The rugosity of granite, although the granite was non-porous structure, has a decided effect on stability, due to offering more points of contact. The water-worn lake sand naturally is low in value. Such sands on the other hand are abundant and generally available and capable of producing good results when properly manipulated.

Effect of Aggregate on Stability of Bituminous Mixes

Prevost Hubbard, chemical engineer, Asphalt Association, pointed out that two sands of the same grading may possess entirely different stability values, probably due to surface texture. Different mineral fillers may also vary greatly in their stabilizing values due to their fineness and surface texture. Mr. Hubbard called attention to the value of stability tests in determining the suitability of mineral aggregates for bituminous mixtures, and stated that in his experience the density of compacted aggregate cannot be safely estimated from screen or sieve analyses. The author showed numerous slides and diagrams to illustrate his paper.

Coarse Aggregates in Concrete

F. C. Lang, engineer of tests and inspection, Minnesota Highway Department, discussed the quality of coarse aggregate and stated that in general the following conclusions may be drawn from the data available:

Coarse aggregate deficient in structural strength as shown by the abrasion test has more effect on transverse and tensile strength of concrete than on the compressive strength.

The absorption in itself has no effect on the strength of the concrete when the effective water cement ratio is correctly used.

There are not enough data to warrant conclusions as to the effect of shape and surface texture.

F. R. McMillan and Geo. W. Ward of the Portland Cement Association submitted a paper which reviewed the durability of mineral aggregates from a geological standpoint. Particular attention was called to the lack of durability of certain classes of chert. Reference was made to certain concrete failures which have been traced to unsatisfactory coarse aggregates and the need for more careful study of the durability of aggregates.

S. H. Ingberg, chief of resistance section, U. S. Bureau of Standards, called attention to the need of further work on the effect of fine aggregate on fire resistance as well as studies of coarse aggregate. It was pointed out that the form of structural members does not greatly effect their behavior in case of fire. It would be expected that horizontal members would more likely lose protection from cracking and spalling than vertical members, but then an examination of fire ruins do not indicate a large difference. The author concludes that "it becomes necessary not only to recognize difference in fire resistances of concrete made with different aggregates but also in the severity of fires to be expected with various building occupancies or amounts of combustible materials associated with them. Only thus can the best utilization be made as the sources of aggregate supplies available in a given locality."

Aggregates for Low Cost Roads

C. N. Conner, engineer executive, American Road Builders Association, gave a paper based on information collected during an investigation of the low cost road situation. The paper points out the necessity for considering sources of supply, preparation, physical characteristics, quality, gradation and serviceability for the particular conditions to be met.

Mineral Aggregate for Sewage Disposal and Railroad Ballast

Herbert F. Kriege, in charge of tests, France Stone Co. laboratory—presented a very comprehensive paper on mineral aggregates which are not to be used in concrete. The author emphasized the fact that the ordinary tests are of no value for determining the durability of aggregates to be used in sewage disposal plants; that is, hardness, toughness, abrasion and absorption are not a correct indication of the durability of a material which is to be subjected to the effect of freezing and weathering in such plants.

The discussion of this paper brought out the importance of the sodium sulphate test as an accelerated method for predicting durability of aggregates for sewage disposal, ballast and concrete. Various members of the Society presented their ideas as to the limitations of this method and advanced suggestions for the improvement of the sodium sulphate test.

Needed Research on Mineral Aggregates

F. H. Jackson, engineer of tests, U. S. Bureau of Public Roads, concluded the symposium with suggestions as to various aggregate problems which appear to be in need of solution. Attention was called to the fact that fundamental knowledge

regarding the properties and uses of mineral aggregate has not kept pace with the actual use of such materials in construction. There is need of a correlating agency to review and analyze existing data as well as co-ordinate future activities.

Professor A. N. Talbot emphasized this point in discussing Mr. Jackson's paper and it is hoped that some organizations will undertake the work. It is the writer's opinion that this might be done by some outstanding engineer such as Professor Talbot himself and thus provide the engineering profession with an authentic development of the existing information on mineral aggregates.

Mr. Jackson briefly summarized some of the more important problems as follows:

Relation between character of aggregate and flexural strength of concrete.
Relation between character of aggregates and durability of concrete.
Standardization of laboratory tests for durability of aggregates.
Standardization of laboratory tests to indicate directly the quality of aggregates for concrete.
Relation between character of aggregates and stability of bituminous mixtures.
Standardization of a test for stability of bituminous mixtures.

Tests of Powdered Admixtures in Concrete

The last session of the Society attracted considerable interest due to the presentation of a paper by Prof. Duff A. Abrams on the tests of concrete using powdered admixtures. The findings reported by Prof. Abrams in this paper are so different from those given by many other experimenters that the paper provoked a great deal of discussion by the producers of admixtures. The well-known disposition of Prof. Abrams to be conservative in his statements lends additional weight to those he made in connection with his report. This paper was not preprinted but a number of copies had been sent out to manufacturers of admixtures. The Society will print this paper and it should be available for distribution within the next few weeks.

Some of the important statements made in the paper are noted below. It is impossible to give the data and curves which Prof. Abrams included in support of his statements.

The report covers two series of tests made in the winter and spring of 1929 in the research laboratory of the International Cement Corp., New York. Both series of tests were made from the same materials under the same conditions. Two cements were used:

(1) Standard portland cement, a mixture of equal parts of four brands.
(2) High-early strength portland cement, ground to 98% through the 200-mesh sieve.

The workability of the concrete was measured by the flow and slump tests. Fourteen different admixtures were used of which seven were commercial materials obtained from manufacturers or dealers and the other materials were powdered materials of various kinds. The following paragraphs are extracted from the report:

Effects of Powdered Admixtures

"The first feature to strike the attention in testing concrete with admixtures is that in general more mixing water is required to produce a given flow. This leads to a closer inquiry as to the reason for the additional water and a comparison of the effects of similar water additions if admixtures were not present.

"The quantity of mixing water required for concrete seems to be dictated by the following considerations: Hydration of cement; forming a plastic mass of dry material; absorption of aggregates and cement.

"In the actual making of concrete the quantity of water for hydration is only incidental and is generally small as compared with the quantity necessary for workability. The same water which is used for workability and absorption is later available for hydration (provided it is not allowed to escape prematurely by improper curing)."

The author introduced a new term which he calls "excess water" which is defined as, "the quantity of mixing water which must be added to the batch in order to maintain a given flow when cement is increased or admixtures used." He also stated that some admixtures have a slight hydraulic value and tend to set and harden in the presence of water.

The report continued:

"Such materials show a small increase in strength especially at early ages. The non-hydraulic admixtures without exception showed reduction in strength of concrete. The reduction was more pronounced at early ages. There is an intimate relation between the reduction in concrete strength and excess water.

"It is a strange commentary on the unsatisfactory state of previous knowledge of this subject, that one of the producers of admixtures emphasizes as a particular feature, the high excess water factor—the very property which makes this admixture fatal to both flow of concrete and strength. . . . All of the commercial admixtures included in these tests must be characterized as undesirable adulterants which reduce both the flow and strength of concrete.

"The workability of the concrete as measured by the flow test was not improved by any of the 14 powdered admixtures tested. . . . The excess water required to produce same workability as similar concrete without admixture was approximately proportional to the normal consistency of the admixture as measured by the Vicat needle.

Admixtures Classed as Injurious

"All of the commercial admixtures tested must be classed as injurious adulterants, due to excess water required to maintain workability. The reduction in concrete strength was proportional to the excess water."

These paragraphs selected at random from the report of Prof. Abrams indicate the general nature of the findings as given in the report. The effect of admixtures appear to be the same whether they replace cement or are added to the concrete without reducing the cement. Undoubtedly this report will stimulate great activity in testing concrete in which admixtures are used and the writer anticipates an avalanche of test data being developed by the manufacturers of admixtures as well as similar tests conducted by various laboratories.

The report does not name specific admixtures but they can be clearly identified by a careful reading and study of the data. In reviewing the report the writer has purposely refrained from mentioning the names of the admixtures with the feeling that it would be unfair to Prof. Abrams as well as the producers of such admixtures to endeavor to be specific without having the supporting data to bring out the facts concerning each admixture. We believe that the quotations from various parts of the report will be sufficient to call attention to the work which has been done.

Feldspar Grinders' Institute Organized

THE Feldspar Grinders Institute, Inc., has been organized by officers of the concerns engaged in the grinding of feldspar for the purpose of fostering friendly relations and cooperation among its members and the trade for the promotion of the feldspar industry.

The officers of the institute are: President, J. Alfred Dennis, Golding-Keene Co., Keene, N. H.; vice-president, H. P. Margerum, Consolidated Feldspar Co., Trenton, N. J.; secretary-treasurer, L. L. Hunt, Bedford Mining Co., Bedford, N. Y. The directors are: Richard Wainford, Trenton, Flint and Spar Co., Trenton, N. J.; Norman G. Smith, Maine Feldspar Co., Brunswick, Maine; C. H. Pedrick, Jr., United Feldspar Corp., New York; H. G. MacLear, Green Hill Mining Co., New York City.

These officers and directors have elected W. J. Parker, 7 East 44th street, New York, as commissioner of the institute. Mr. Parker has had years of experience in trade association work and will endeavor to carry out the purpose of this institute with the idea of improving the industry as a unit.

Effect of Type and Gradation of Coarse Aggregate Upon the Strength of Concrete

Extracts from a Report by W. F. Kellermann, Assistant Materials Engineer, Division of Tests, U. S. Bureau of Public Roads, in "Public Roads" for June, 1929

WHEN concrete is to be used in the construction of pavements, the crushing strength, although still important, is no longer the critical factor. Concrete pavements should be designed to support, without cracking, heavy concentrated loads which subject them to high bending stresses.

Flexural strength thus becomes the most important strength characteristic, and the factors which affect it become of interest to the highway engineer. To illustrate this distinction: It has been demonstrated through research that within quite wide limits the kind of coarse aggregate employed has relatively little effect on the crushing strength of concrete, provided the mixture is workable and the aggregates sound. This is not true in the case of flexure, however, all of the test data so far accumulated indicating that such factors as surface texture, angularity of fragments, and other characteristics of the aggregates affect the flexural and tensile strength of the concrete to a marked degree. The tests which are reported in this paper substantiate earlier experiments along the same lines and indicate that the character of aggregate must be given consideration in the design of concrete for pavements.

These tests also indicate that the compressive strength of concrete may be affected by the character of the coarse aggregate to a considerably greater extent than has been shown by prior investigations.

Variety of Coarse Aggregates and Aggregate Gradings Tested

The tests were conducted primarily for the purpose of determining the effect of type of coarse aggregate upon the flexural strength of concrete. Auxiliary data regarding resistance to direct tension as well as crushing strength and yield of concrete were also obtained. Seventeen typical coarse aggregates, including seven gravels, seven crushed stones and three blast-furnace slags were selected from various sources so as to give as wide a range in physical characteristics as possible. These were tested in concrete, using four typical coarse aggregate gradings as well as four paving mixes. The sand used was a typical high-grade concrete sand. Its physical properties as well as those of the portland cement employed in the tests are given in Table 1. The physical properties of the various coarse aggregates are given in Tables 2 and 3.

Each coarse aggregate was separated into four sizes at the laboratory and recombined into four definite gradings as shown below. These gradings will be referred to by number and it should be noted that they range from coarse to fine in numerical order of designation.

Grading No.	Percentage passing—square openings				
	⅛-in.	¼-in.	¾-in.	1¼-in.	2-in.
1	0	0	15	40	100
2	0	0	30	55	100
3	0	5	45	70	100
4	0	5	55	100	100

Table 4 gives the weight per cubic foot (dry rodded) and the percentage of voids for each coarse aggregate and for each grading.

All aggregates are identified by number rather than by source of supply.

In outlining this series of tests it was thought advisable to include more than one proportion, and for this reason four nominal mixes (based on dry-rodded volumes) were included, with the following proportions:

Mix No. 1—1:1.6:3.
Mix No. 2—1:1.6:4.
Mix No. 3—1:2:4.
Mix No. 4—1:2:4½.

Mixes No. 1 and No. 2 were designed to correspond approximately to 1:2:3 and 1:2:4 field mixes, respectively.

It will be noted that mix No. 4 (1:2:4½) is the only one which does not conform to present practice. This proportion was used in an endeavor to determine the manner in which the lower sanded mixes behave in flexture as compared to mixes containing smaller amounts of coarse aggregate, but with the same sand-cement ratio.

TABLE 1.—PHYSICAL PROPERTIES OF CEMENT AND FINE AGGREGATE USED IN ALL TESTS

Cement	
Fineness, percentage retained on 200-mesh sieve, 11.5.	
Time of set (Gillmore):	
Initial, 3 hr. 10 min.	
Final, 5 hr. 35 min.	
Steam test for soundness, O.K.	
Normal consistency, 23.1%.	
Tensile strength (lb./in.², 1:3 Ottawa sand mortar):	Lb.
7 days	285
28 days	380
Fine Aggregate	
Sieve analysis:	Pct.
Total retained on ¼-in. screen	1
Total retained on No. 10 sieve	12
Total retained on No. 20 sieve	25
Total retained on No. 30 sieve	42
Total retained on No. 40 sieve	72
Total retained on No. 50 sieve	93
Total retained on No. 100 sieve	100
Silt and clay	0.3
Apparent specific gravity	2.66
Weight in lb. per cu. ft. (dry rodded)	104
Organic matter (color test)	Satisfactory
Strength ratio:	
7 days	117
28 days	120

Description: Sand consists essentially of subangular grains of quartz, sandstone and shale, slate and feldspar.

Fabrication and Testing of Specimens

The procedure followed was to make up specimens for mix No. 1 and grading No. 1, using all aggregates, on the same day. Gradings No. 2, No. 3, and No. 4 were then made in turn on following days. This was repeated for mixes No. 2, No. 3, and No. 4, in the order named, so that the first round of tests consisted of the four mixes and the four gradings for each of the gravel and stone aggregates and two mixes and four gradings of each for the slag aggregates, the harsher mixes, No. 2 and No. 4, not being used with the slags. This required 16 working days to complete one round of tests and, where the quantity of material permitted, four complete rounds were made, making a total of 64 batches of concrete for each aggregate. Thus the general averages given in Table 5 are in practically all cases based on tests on 64 specimens. Each batch of concrete was large enough to make one 6 by 6 by 30-in. beam and one 6 by 21-in. tension cylinder with some excess. The volume of concrete in each batch was measured for yield determination

All mixing was done by hand in dry pans, the amount of water used being that required to produce a consistency corresponding to a flow of 150.[1] In making the tension cylinders the concrete was placed in three layers, each layer being rodded about thirty times with the same rod. Due to the limited facilities for handling the large number of specimens involved it was found necessary to keep them in moist air for 28 days after 1 day in the molds, so that the age at test was 29 days instead of the conventional 28 days.

The beams were tested with a portable cantilever device with an extension arm and dynamometer for applying the load. The tension cylinders were broken in a 100,000-lb. Universal testing machine. A set of grips similar to those designed in the research laboratory of the Portland Cement Association was used for gripping the specimens.

Remnants from the tension specimens were capped with a neat cement paste made with a calcium chloride solution and broken in compression at 33 days.

The average results of all strength tests for all aggregates except the three slags omitted because they were not included in mixes No. 2 and No. 4, together with the

[1]Percentage of original diameter of the mass after 15 drops of ½ in. in 10 seconds on a 30-in. flow table.

corresponding water-cement ratios and cement factors, is given in Table 5. The unit values for the tensile strength and modulus of rupture were calculated to the nearest pound. These figures were carried through to the final averages. In the tables, however, the unit values are given to the nearest 5 lb. The water-cement ratios reported in this and other tables were based on the total amounts of water added to each batch without correction for absorption of aggregates.

Results Show Water-Cement Ratio Not the Only Factor Affecting Strength

The aggregates have been found to arrange themselves in three general groups. For the purpose of discussion those showing a modulus of rupture of more than 550 lb. per sq. in. have been placed in the first group, those between 550 and 500 in the second group, and those less than 500 in the third group. In the first group there are four aggregates, Nos. 46, 62, 66, and 67 (one siliceous limestone, one cherty limestone, and two limestone gravels), with but 10 lb. per sq. in. difference among them. In the second group there are six aggregates, Nos. 40, 50, 60, 61, 68, and 72 (one each of trap, granite, sandstone, shell limestone, and two siliceous gravels), while in the third or low group are four aggregates, Nos. 44, 63, 64, and 65 (three siliceous gravels and one argillaceous limestone).

The average strengths in tension, compression, and bending for each aggregate vary from the average for all aggregates. The highest value for modulus of rupture exceeds the lowest value by 27%. A question naturally arises as to the reason for this difference, and it is explained by a consideration of such factors as water content, absorption, angularity of particles, and structural soundness of the aggregates. Since all of the concrete was made to the same consistency and the proportions and gradation for a given condition were constant, the amount of water used depended to a large extent upon the shape and absorption of the aggregates.

It may be assumed that other factors remaining the same, the amount of mixing water or the water-cement ratio used would be the cause of this difference. Comparing the siliceous gravel aggregate No. 64 with a water-cement ratio of 0.85% and an absorption of 0.50% with the siliceous limestone aggregate No. 46 with a water-cement ratio of 0.86% and an absorption of 0.04%, we would expect the siliceous gravel to absorb a considerable amount of water, while the siliceous limestone would not, thereby lowering the net water-cement ratio in the case of the siliceous gravel. Under these circumstances the siliceous gravel should give the higher flexual strength, but on the contrary the siliceous limestone gave a strength 27% higher than the siliceous gravel. Following the same line of thought, the siliceous gravel (No. 64) should give higher strengths than a number of the other materials, but reference to the data will show that this is not the case. Comparing other aggregates on the same basis will show that in so far as this investigation is concerned the water-cement ratio is not the only factor which controls the strength.

Considering next the angularity of the particles of the coarse aggregate, we see from Table 2 that the siliceous limestone and cherty limestone aggregates in the high group designated as Nos. 46 and 62, consisted entirely of crushed particles, while the limestone gravel designated as No. 66 had from 33% to 39% crushed and No. 67, a limestone gravel, had from 67% to 92%, depending upon the particular gradation considered. The two limestone gravels differ from the two limestones mentioned first in that they are crushed gravels and have some surfaces rounded, while the limestones are 100% crushed. In the low group, the siliceous gravels, Nos. 44 and 64 both had a very low percentage of crushed material, although the siliceous gravel, No. 65, also of the low group, had a greater percentage than the limestone gravel, No. 66, in the high group. The trap, siliceous limestone, and granite (Nos. 40, 46 and 60), all had 100% crushed material, but this siliceous

TABLE 2.—PHYSICAL PROPERTIES OF COARSE AGGREGATES

Aggregate No.		Per cent wear	Per cent absorption	Specific gravity	Per cent crushed material
40	(trap)	2.4*	0.09	2.91	100
44	(siliceous gravel)	9.9†	0.58	2.59	13–28‡
46	(siliceous limestone)	3.0*	0.04	2.76	100
50	(siliceous gravel)	10.8†	0.98	2.60	45
60	(granite)	2.0*	0.17	2.61	100
61	(sandstone)	13.2*	4.55	2.23	100
62	(cherty limestone)	3.5*	0.16	2.66	100
63§	(argillaceous limestone)	6.8*	4.42	2.30	100
63a¶	(argillaceous limestone)	10.4*	6.56	2.18	100
64	(siliceous gravel)	14.5†	0.50	2.65	20
65	(siliceous gravel)	13.4†	0.36	2.61	46–76‡
66	(limestone gravel)	9.8†	1.23	2.64	33–39‡
67	(limestone gravel)	15.1*	2.17	2.57	67–92‡
68	(siliceous gravel)	12.8†	0.32	2.58	15
69	(slag)	22.5*	.....	1.83	100
70	(slag)	13.7*	.....	2.06	100
71	(slag)	12.2*	.....	2.27	100
72	(shell limestone)	7.0*	1.87	2.47	100

*Test made on crushed material.
†Standard test for gravel.
‡The percentage of crushed material in different gradings was as follows:

	Grading No. 1	2	3	4
Aggregate No. 44	13	14	28	20
Aggregate No. 65	50	46	76	67
Aggregate No. 66	33	33	35	39
Aggregate No. 67	71	67	92	88

§First shipment of material.
¶Second shipment of material.

TABLE 3.—MINERAL COMPOSITION OF COARSE AGGREGATES

Aggregate No.	Mineral composition
40	Trap—Diabase and basalt.
44	Gravel—Quartzite, 65%; quartz, 30%; ironstone concretions, 2%; chert, 3%.
46	Siliceous limestone—Massive limestone, 98%; lime, calcite veins, or pure calcite pieces, 2%.
50	Gravel—Quartzite, 60%; gneiss, 20%; slate, 15%; chert, 1%; basic igneous, 4%.
60	Granite—Dark, 25%; gray, 10%; pink, 65%.
61	Sandstone—Rounded fragments.
62	Cherty limestone—Pure limestone, 30%; chert limestone, 70%.
63	Argillaceous limestone—Light, 50%; dark, 50%.
64	Gravel—Milk quartz, 10%; gneiss, 80%; badly weathered gneiss, 10%.
65	Gravel—Quartz, 90%; gneiss, schist and basic minerals, 10%.
66	Gravel—Cherty dolomite (three colors).
67	Gravel limestone—Thin rounded limestone, 75%; chert, 5%; basic rocks, granites, 20%.
68	Gravel—Granular milk quartz, 80%; rotten chert, 15%; gneiss, 5%.
69	Slag.
70	Slag.
71	Slag.
72	Limestone—Shell limestone.

TABLE 4.—WEIGHT PER CUBIC FOOT AND PERCENTAGE OF VOIDS OF COARSE AGGREGATES

Aggregate No.		Grading No. 1 Wt., lb./cu.ft.	No. 1 Voids, per cent	No. 2 Wt., lb./cu.ft.	No. 2 Voids, per cent	No. 3 Wt., lb./cu.ft.	No. 3 Voids, per cent	No. 4 Wt., lb./cu.ft.	No. 4 Voids, per cent
40	(trap)	105	42	105	42	106	42	105	42
44	(siliceous gravel)	110	32	111	31	113	30	110	32
46	(siliceous limestone)	101	41	101	41	102	41	102	41
50	(siliceous gravel)	105	35	106	35	108	33	108	33
60	(granite)	99	39	100	39	101	38	100	39
61	(sandstone)	88	37	88	37	90	35	90	35
62	(cherty limestone)	99	40	100	40	100	40	100	40
63*	(argillaceous limestone)	88	39	88	39	90	38	90	38
63a†	(argillaceous limestone)	85	38	86	37	87	36	.....	.....
64	(siliceous gravel)	109	34	111	33	111	33	112	32
65	(siliceous gravel)	109	33	110	33	110	33	108	34
66	(limestone gravel)	107	35	108	35	109	34	108	35
67	(limestone gravel)	105	34	107	33	108	33	106	34
68	(siliceous gravel)	108	33	110	32	110	32	110	32
69	(slag)	65	43	67	41	66	42	68	40
70	(slag)	74	43	76	41	77	40	78	40
71	(slag)	82	42	83	42	83	42	85	40
72	(shell limestone)	90	42	90	42	90	42	89	42

*First shipment of material.
†Second shipment of material.

TABLE 5.—WATER-CEMENT RATIO, CEMENT FACTOR AND STRENGTH TESTS—GENERAL AVERAGE OF ALL MIXES AND ALL GRADINGS*

Aggregate No.		W:C	Bags of cement per cu.yd.	Modulus of rupture, lb./in.²	Tensile strength, lb./in.²	Compressive strength, lb./in.²
40	(trap)	0.85	6.08	525	220	2850
44	(siliceous gravel)	0.84	5.53	475	195	2860
46	(siliceous limestone)	0.86	5.99	590	235	2940
50	(siliceous gravel)	0.85	5.63	530	215	2980
60	(granite)	0.88	5.84	520	225	3020
61	(sandstone)	1.08	5.73	530	235	3470
62	(cherty limestone)	0.88	5.91	590	235	2940
63	(argillaceous limestone)	1.01	5.92	495	240	3140
64	(siliceous gravel)	0.85	5.63	465	190	2920
65	(siliceous gravel)	0.83	5.64	495	195	2860
66	(limestone gravel)	0.86	5.69	585	250	3310
67	(limestone gravel)	0.89	5.68	580	250	3300
68	(siliceous gravel)	0.84	5.61	525	210	2920
72	(shell limestone)	0.96	5.95	550	255	3140

*Flexure and tension specimens broken at 29 days, compression specimens broken at 33 days.

limestone showed a strength about 13% higher than the other two.

Mineral Composition of Aggregate Found to Be Important

Since these facts do not explain the strength variations described let us examine the physical characteristics of the coarse aggregates still further. Taking first the high group, we see from Table 3 that No. 46 is a siliceous limestone, No. 62 is a cherty limestone, No. 66 is a cherty dolomitic crushed gravel, and No. 67 is a crushed limestone gravel with some chert. Two of these materials are crushed stones, one is a crushed gravel with about one-third crushed pieces, and the fourth is a gravel with about three-fourths crushed pieces. All of these materials are from different sources, two of them falling into the general class of crushed stone aggregates and two into the general class of gravel aggregates. From a mineralogical standpoint, however, they are practically the same.

Considering the low group, we find Nos. 44 and 65 are essentially quartz gravels, while No. 64 is a gravel composed mostly of gneiss and quartz. No. 63 is an entirely different material, being a soft argillaceous limestone. This particular material was of two varieties and varied considerably throughout the series. The quartz gravels, Nos. 50 and 68, may be placed in the same mineral group with Nos. 44 and 65, but they show a considerably higher flexural strength and were placed in the intermediate strength group. Since in the material found in any one of these aggregates weathering may have progressed farther than in similar material in another, we might expect a difference in structural soundness.

Of the aggregates in the intermediate group, No. 40 is a very hard and heavy trap rock; No. 60 is a sound granite; No. 61 is a very soft sandstone, practically every piece of which fractured in the flexure tests; No. 68 is a material somewhat similar to No. 50, but from an entirely different source; and No. 72 is a shell limestone containing many soft pieces but which gave much higher strength than any other aggregate listed in the intermediate group.

Considering all factors, the tests clearly indicate that the mineral composition of the coarse aggregate is of prime importance and must be considered along with other factors when the question of resistance to bending arises.

Referring again to Table 5, and examining the tensile strength values, we find a difference of 34% between the highest and lowest results. In this particular case the shell limestone aggregate No. 72 shows the highest value, with the limestone gravel aggregates Nos. 66 and 67 only slightly lower. It will be remembered that the latter two aggregates showed very high strength in the flexure tests. The siliceous limestone, cherty limestone, sandstone and argillaceous limestone (Nos. 46, 62, 61, and 63) also show high tensile strength. In fact, the difference among eight aggregates, beginning with No. 68 at 210 lb./in.² and ending with No. 63 at 240 lb./in.² is very slight. However, the values are rather small, which makes the percentage variations large. There is a distinctive low group composed of three siliceous gravels (Nos. 64, 44 and 65,), the same aggregates showing low flexural strength. It is readily apparent that the aggregates do not arrange themselves in exactly the same order in tensile strength that they do in flexure, the main difference occurring in the soft sandstone and limestone aggregates, Nos. 61, 63 and 72, which show a higher relative strength with respect to the other aggregates in tension than in flexure.

Ratio Between Compression, Tension and Rupture

In the compressive tests also shown in Table 5, we see that with the exception of the sandstone and two limestone gravels Nos. 61, 66 and 67, the average crushing strength runs fairly close to 3,000 lb./in.² for all aggregates. Comparing the compression data with that for flexure and tension shows that two limestone gravel aggregates Nos. 66 and 67 are outstandingly high for all three types of test, while three of the siliceous gravels Nos. 44, 64, and 65 are low in all cases. For the balance of the materials, however, there appears to be no consistent relation between compression and either modulus of rupture or direct tension. These values in general show the fallacy of attempting to use direct ratios between compression, tension and flexture in a general way, and without taking into account the particular material at hand.

The strength values for each mix, individually and collectively as well as the corresponding water-cement ratios and cement factors for each mix has been plotted in detail. In the following table abstracted from Table 6 in the original report the lowest and highest moduli of rupture are given as well as respective water-cement ratios:

Aggregate No.	W:C	Modulus of rupture, lb./in.²
1:1.6:3 Mix		
Low—No. 44 (siliceous gravel)	0.74	530
High—No. 62 (cherty limestone)	0.76	655
1:1.6:4 Mix		
Low —No. 64 (siliceous gravel)	0.80	475
High—No. 62 (cherty limestone)	0.83	615
1:2:4 Mix		
Low —No. 64	0.91	435
High—No. 62	0.95	555
1:2:4½ Mix		
Low —No. 64	0.93	420
High—No. 46 (siliceous limestone)	0.94	555

The three slag aggregates, Nos. 69, 70, and 71, included for the 1:1.6:3 and 1:2:4 mixes, shows relatively high values for modulus of rupture for the 1:1.6:3 mix, but the corresponding values for 1:2:4 mix are somewhat low as compared to the calcareous materials comprising the high-strength group. Examining the four modulus of rupture curves collectively we see that in general they are parallel, the greatest discrepancy being sandstone aggregate No. 61, which shows quite erratic results. It is also interesting to note that the curves for the 1:1.6:3 and 1:1.6:4 mixes dip down in the case of the argillaceous limestone aggregate No. 63, while for the two leaner mixes they go up. For the trap aggregate No. 40, the curves dip down for the leaner mixes, while they go up for the richer ones. Considering the two materials, No. 40 is a very hard trap rock which we would naturally expect to show to better advantage in a rich mix, while No. 63, being a softer material, the opposite is of course true. Relatively high strengths were attached for the granite aggregate No. 60 in the two richer mixes.

Results Indicate Desirability of Determining Concrete-Making Properties of Aggregates

The relation between flexural strength and proportions as affected by either changes in the sand-cement ratio or the amount of coarse aggregate are as follows: Using mix No. 3, 1:2:4, as the starting point, we find that increasing the amount of coarse aggregate to 4½ parts only slightly lowers the strength, the average difference in modulus of rupture being only 15 lb./in.² On the other hand, decreasing the sand to 1.6 parts (mix No. 2) and holding the coarse aggregate constant has a marked effect, the average increase for all aggregates being 50 lb./in.² Comparing the 1:1.6:3 and 1:1.6:4 mixes (Nos. 1 and 2) likewise shows that decreasing the coarse aggregate one part, with the sand held constant, still further increases the strength about 40 lb./in.² It is interesting to note, however, that the maximum variations in strength for a given mix due to type of aggregate is as great as the average difference in strength between the richest and leanest mixes used. The siliceous limestone aggregate No. 46, for instance, used in a 1:2:4½ mix, develops a somewhat higher strength than siliceous gravel aggregate No. 64 in the 1:1.6:3 mix. Reference to data shows that in the first case 5.27 bags of cement were used per cubic yard of concrete, whereas in the second case 6.57 bags were required. The economic possibilities resulting from a study of the concrete making properties of aggregates should be obvious to any one studying these data.

Referring now to the tensile strength we note that the three slag aggregates are high in strength for the 1:1.6:3 mix while in the 1:2:4 mix, slag No. 70 shows the highest strength of all, with the other two slags, Nos. 69 and 71, in the high group. One noticeable difference between these curves and those for the flexure tests is that the greatest difference in tensile strength was found between the 1:1.6:3 and 1:1.6:4 mixes (Nos. 1 and 2) instead of between the 1:2:4 and 1:2:4½ mixes (Nos. 2 and 3). This is an indication that the tensile and flexural strength does not increase in exactly the same ratio as the mix is changed. This will be discussed more fully later.

In the compression tests two of the slags,

Nos. 70 and 71, are fairly high in strength in the 1:1.6:3 mix, while the other slag, No. 69, is slightly below the average. In the 1:2:4 mix, however, slag No. 70 is about the average, while Nos. 69 and 71 are below the average, showing a slight falling off in strength for the slags in the leaner mix. In all mixes, the sandstone No. 61 is higher than any other aggregate, while the limestone gravels, Nos. 66 and 67, also show consistently high values. In general, there is about the same difference in strength between the 1:1.6:3 and 1:1.6:4 mixes as between the 1:1.6:4 and 1:2:4 mix, while the 1:2:4½ mix was close to the 1:2:4 mix, as was the case in tension and flexure.

Effects of Variation in Grading

The modulus of rupture curves show no consistent difference in strength for variations in grading, although it is noticed that for the softer aggregates, Nos. 61, 63, and 72 (sandstone, argillaceous limestone, and shell limestone), grading No. 4 gave the lowest values. In most cases, gradings No. 1 or No. 2 were high in strength, while No. 3 or No. 4 were low, the most noticeable exception being limestone gravel aggregate No. 66, which gave a high value for grading No. 4, and low value for grading No. 2. In most cases, as for aggregates Nos. 44, 65, 67, and 68, the difference for all four gradings was so slight as to indicate that within the ranges used in this investigation the grading of the coarse aggregate has little direct effect upon flexural strength.

In the tensile-strength tests grading No. 1 resulted in low values in all but two cases, while grading No. 4 usually gave the highest values. One possible explanation for this is the relation between the size of the cross section of the specimen and the maximum size of aggregate used. In grading No. 1, 60% of the material was retained on the 1¼-in. screen. The tension specimens had approximately 6-in. circular cross sections and it is believed that a larger cross section would probably have given higher strengths for the coarser gradings. One of the conclusions reached by Gonnerman and Shuman in their paper, "Compression, Flexural and Tension Tests of Plain Concrete,"* was that the size of specimen did not affect the tensile strength. However, it must be remembered that in their work the maximum size of aggregate was 1½ in. The fact that grading No. 4, which had no particles greater than 1¼-in., gave the highest values in tension, but did not do so in flexure or compression, is an indication that variations in grading possibly affect the tensile strength to a greater extent than they affect the flexural or compressive strength.

No Relation Between Results of Abrasion Test and Strength of Concrete

On examination of the compressive-strength data we note just the opposite effect; that is, grading No. 4 shows low values generally while grading No. 2 is high in strength. Taking into account the fact that the compression tests were made on the broken tension pieces, the results give indications that, from the standpoint of strength, changing the grading may produce opposite results in different types of tests.

The results of abrasion tests on each of the coarse aggregates are given in Table 2, together with a notation in each case, indicating the particular type of abrasion test made. It may be concluded from data that, within the range of quality here considered, no relation exists between the quality of the coarse aggregate as measured by this test and the strength of the concrete.

Relation Between Type of Aggregate and Yield Studied

The effect of shape of coarse aggregate fragment on yield is very apparent. Gravel aggregates Nos. 64, 44, 50, 65, 68, 67, and 66, all of which contain rounded fragments, show consistently higher yields or lower cement factors than any of the aggregates consisting of crushed fragments. This of course is merely the effect of variations in void content due to shape of particles. There is a maximum variation of 12% in voids for 14 of the 17 types comprised in this study. This occurs for grading No. 3 and caused a maximum variation in the cement factor of 0.56 bags of cement. These values illustrate the effect of shape of aggregate fragment on yield when the proportioning is done by the usual volumetric method.

The effect of grading of coarse aggregate on yield for each type of aggregate shows that grading No. 1, in general, requires somewhat more cement than the others. However, the maximum variation in cement requirement due to gradation, within the limits used in this investigation is much less than the variation due to type of aggregate. It must be remembered in this connection that only reasonably uniform gradations were employed. For wide variations in grading the differences in the cement content would have been much greater.

In the construction of concrete pavements the cost of the materials is influenced to a large extent by the amount of cement required to produce a cubic yard of concrete. It has just been shown that the cement factor varied considerably with the different aggregates used in this investigation. If our only problem were to construct a slab containing concrete proportioned arbitrarily by volume, we would naturally select aggregates producing the highest yield. If, on the other hand, we had only to design a slab with a specified strength without considering economy, we might select entirely different aggregates. The ideal aggregate is the one giving high strength and also high yield. By dividing the flexural strength of each aggregate by the corresponding cement factor, we obtain a series of values which may be used to compare these aggregates on a strength-yield basis. This has been done for general average values. There are four aggregates which stand out above the others. They are Nos. 46, 62, 66, and 67 (two limestones and two limestone gravels), the same four that gave the highest flexural strength. There are four others, Nos. 50, 61, 68, and 72, which are grouped together while the remaining six, Nos. 40, 44, 60, 63, 64, and 65, show a rather low factor. With the exception of the trap and argillaceous limestone aggregates Nos. 40 and 63, the aggregates line up in somewhat the same order as before.

These facts demonstrate that the increased strength developed by certain aggregates is not due entirely to increased cement content in terms of unit of volume of concrete. If the variations in strength were due to this cause alone, we should expect the strength-yield factors derived in the above manner to produce a horizontal line instead of an ascending curve.

The values for tension and compression tests as well as the transverse test results discussed above indicate that the strength of the concretes must have been affected by factors inherent in the aggregates as

TABLE 9.—RATIOS BETWEEN STRENGTH IN FLEXURE, TENSION AND COMPRESSION FOR EACH MIX (AVERAGE OF FOUR GRADINGS)*

Aggregate No.	1:1.6:3 Ten. / Mod.	1:1.6:3 Ten. / Comp.	1:1.6:3 Mod. / Comp.	1:1.6:4 Ten. / Mod.	1:1.6:4 Ten. / Comp.	1:1.6:4 Mod. / Comp.	1:2:4 Ten. / Mod.	1:2:4 Ten. / Comp.	1:2:4 Mod. / Comp.	1:2:4½ Ten. / Mod.	1:2:4½ Ten. / Comp.	1:2:4½ Mod. / Comp.
40	0.44	0.077	0.176	0.38	0.070	0.186	0.43	0.079	0.185	0.42	0.080	0.189
44	0.44	0.071	0.160	0.39	0.064	0.161	0.43	0.072	0.167	0.38	0.068	0.177
46	0.42	0.080	0.188	0.38	0.077	0.202	0.41	0.084	0.206	0.37	0.077	0.210
50	0.44	0.074	0.166	0.39	0.067	0.173	0.41	0.077	0.187	0.39	0.074	0.189
60	0.47	0.075	0.162	0.41	0.073	0.179	0.43	0.075	0.175	0.40	0.073	0.181
61	0.50	0.068	0.135	0.43	0.065	0.152	0.43	0.074	0.166	0.41	0.067	0.164
62	0.44	0.079	0.181	0.38	0.078	0.205	0.40	0.084	0.212	0.39	0.081	0.210
63	0.50	0.077	0.152	0.48	0.077	0.160	0.48	0.078	0.163	0.47	0.075	0.160
64	0.42	0.066	0.156	0.39	0.061	0.157	0.44	0.072	0.164	0.38	0.062	0.163
65	0.43	0.071	0.166	0.38	0.065	0.171	0.40	0.070	0.173	0.38	0.069	0.184
66	0.45	0.075	0.169	0.42	0.074	0.176	0.43	0.076	0.177	0.40	0.076	**0.190**
67	0.48	0.077	0.162	0.41	0.073	0.176	0.39	0.073	0.186	0.43	0.079	**0.183**
68	0.44	0.075	0.169	0.38	0.068	0.178	0.39	0.073	0.187	0.36	0.068	**0.185**
69	0.53	0.095	0.179	.....	.....	.....	0.44	0.089	0.200	.....	.....	.....
70	0.52	0.087	0.166	.....	.....	.....	0.48	0.090	0.188	.....	.....	.....
71	0.50	0.082	0.165	.....	.....	.....	0.44	0.085	0.192	.....	.....	.....
72	0.52	0.083	0.159	0.44	0.077	0.175	0.46	0.082	0.181	0.43	0.081	0.190
Average	0.47	0.077	0.165	0.40	0.071	0.175	0.43	0.078	0.183	0.40	0.074	0.184

*Flexure and tension specimens broken at 29 days, compression specimens broken at 33 days.

*Proceedings of A. S. T. M., vol. 28, pt. 2, p. 551.

well as by the actual amount of cement present.

In examining the ratios found between the strength in flexure, tension, and compression, given in Tables 9 and 10, it should be remembered that the compression specimens were broken four days after the flexure and tension of specimens were broken, which of course makes the ratio between tension and flexure the only true one. However, the other ratios are useful in making relative comparisons. Table 9 gives the ratios for each mix, while in Table 10 they are given for each grading. There is one point worthy of note in Table 9 and that is the ratios of tension to flexure for the different mixes. The 1:2:4½ mix showed about the same ratios as the 1:1.6:4 mix, both being low, while the 1:1.6:3 mix showed the highest values throughout. The tension-compression ratios are about the same for all four mixes, while the modulus-compression ratios are higher for the lean mixes. These tables show, in general, that the same ratios do not exist between the three types for all aggregates.

TABLE 10.—RATIOS BETWEEN STRENGTHS IN FLEXURE, TENSION AND COMPRESSION FOR EACH GRADING (AVERAGE OF FOUR MIXES)*

Aggregate No.	Grading No. 1			Grading No. 2			Grading No. 3			Grading No. 4		
	Ten. Mod.	Ten. Comp.	Mod. Comp.	Ten. Mod.	Ten. Comp.	Mod. Comp.	Ten. Mod.	Ten. Comp.	Mod. Comp.	Ten. Mod.	Ten. Comp.	Mod. Comp.
40	0.40	0.074	0.182	0.41	0.076	0.186	0.41	0.075	0.181	0.44	0.081	0.185
44	0.38	0.064	0.169	0.42	0.068	0.163	0.43	0.069	0.162	0.44	0.075	0.169
46	0.35	0.072	0.205	0.39	0.076	0.191	0.42	0.082	0.196	0.42	0.088	0.211
50	0.36	0.065	0.181	0.41	0.071	0.172	0.43	0.073	0.172	0.44	0.082	0.186
60	0.39	0.067	0.170	0.42	0.074	0.178	0.44	0.073	0.165	0.47	0.085	0.182
61	0.45	0.068	0.152	0.44	0.065	0.148	0.43	0.067	0.156	0.47	0.072	0.155
62	0.39	0.077	0.198	0.40	0.078	0.193	0.41	0.080	0.195	0.41	0.088	0.215
63	0.46	0.073	0.159	0.48	0.075	0.157	0.50	0.078	0.156	0.49	0.081	0.164
64	0.38	0.062	0.163	0.42	0.066	0.156	0.39	0.063	0.159	0.43	0.069	0.161
65	0.36	0.063	0.177	0.40	0.070	0.176	0.40	0.065	0.164	0.43	0.076	0.176
66	0.41	0.071	0.175	0.43	0.076	0.174	0.44	0.076	0.171	0.42	0.080	0.190
67	0.38	0.070	0.182	0.43	0.073	0.171	0.45	0.078	0.173	0.46	0.082	0.176
68	0.36	0.064	0.181	0.39	0.070	0.177	0.41	0.072	0.178	0.43	0.077	0.180
72	0.42	0.075	0.177	0.47	0.079	0.169	0.47	0.084	0.178	0.48	0.085	0.176
Average	0.39	0.069	0.177	0.42	0.073	0.172	0.43	0.074	0.172	0.45	0.080	0.180

*Flexure and tension specimens broken at 29 days, compression specimens broken at 33 days.

Trial Proportioning of Concrete Desirable

The preceding discussion has demonstrated quite conclusively that the water-cement ratio alone does not control the strength of the concrete. It has been shown that the various coarse aggregates which are in common use today in the construction of pavements may have certain qualities inherent in the aggregates themselves which may cause a wide variation in strength for a given water-cement ratio. Further analysis of the data, however, shows equally well that for any given aggregate, variations in the water-cement ratio will affect the strength substantially in accordance with the well-established fundamental law. This fact is of considerable assistance in connection with the design of concrete paving mixtures to meet certain strength requirements, as will be discussed below.

An attempt was made to correct the apparent water-cement ratios for absorption of coarse aggregate. It was found, however, that certain of the aggregates were so nonhomogeneous that it was impossible to obtain reasonable concordance on repeated tests for absorption. These discrepancies were so great in a number of cases as to lead to the conclusion that the present standard method of making absorption tests on small 1000-gram samples is practically worthless for nonhomogeneous aggregates. Attempts to make mathematical corrections were therefore abandoned and values corresponding to the average water-cement ratios for aggregates having little or no absorption were adopted for each of the four mixes. It was felt that under the circumstances this was the most logical method of showing this relationship, because it assumes that, if it had been possible to make an accurate correction for absorption, the net water-cement ratios for all the aggregate for a given mix would have been approximately the same. The only other variable which might affect this assumption is the shape of the aggregate fragments. It seems reasonable to suppose that, other things being equal, an aggregate having rounded surfaces would require less water than one having angular surfaces. However, inspection of data fails to reveal any significant differences which may be attributed to this factor. It is felt, therefore, that the water-cement ratios assumed for use in the charts are reasonably close to the true values, with the possible exception aggregates Nos. 61 and 63, both of which were highly absorptive.

It was observed that for all three types of tests the strength decreases proportionately with increases in the water-cement ratio, resulting in a series of substantially parallel curves each of which represents the strength-water ratio relation for a given aggregate. For purposes of studying the effect of mineral composion, the aggregates have been grouped into four divisions. The grouping of materials by types as previously discussed is at once apparent. Of interest also is the fact that, in so far as tensile strength is concerned, the curves are practically horizontal for water-cement ratios between 0.8 and 0.94. Aside from this, the relation between strength and water-cement ratio follows the well-known law fairly closely for each type of test.

The fact that these water-cement ratio-strength curves are practically parallel gives us a method of designing concrete paving mixtures by trial as described in the paper, "The Design of Concrete Paving Mixtures by the Water-Cement Ratio Method," which appeared in the August, 1928, issue of *Public Roads*. This method consists in determining for any given water-cement ratio and for each combination of aggregates under consideration the transverse strengths at 28 days under standard laboratory conditions.

Conclusions

Based on the variables included in this investigation and the resulting test data, the following conclusions are drawn:

1. That the tensile, flexural and compressive strength of concrete are affected appreciably by the character of the coarse aggregate used.

2. That the tensile and flexural strength are affected to a greater extent than the compressive strength.

3. That for a given aggregate there is a fairly well defined relation between the strength of the concrete and the water-cement ratio.

4. That variations in the character of the coarse aggregates, other things being equal, may result in a difference in flexural strength equal to that produced by an appreciable change in the water-cement ratio with any given aggregate. In this study, for instance, aggregate No. 46, with a water-cement ratio of 0.94, produced concrete of somewhat higher flexural strength than aggregate No. 44, with a water-cement ratio of 0.74.

5. That there is a fairly definite relation between certain mineralogical characteristics of the coarse aggregate and the strength of concrete, calcareous aggregates in general giving consistently higher flexural and tensile strength than siliceous aggregates.

6. That, in general, aggregates having rounded fragments produce concrete of lower flexural and tensile strength than aggregates which are composed wholly or in part of crushed fragments.

7. That, within the limits of this study, variations in grading of coarse aggregates have no consistent effect upon the strength of concrete. (It is not to be inferred from this statement, however, that control of grading is not important. Variations in grading occurring during construction not only affect yield when measurements are made by volume, but also affect the workability and the uniformity of the concrete.)

8. That, within the range in quality covered by this study, there is no relation between the quality of the coarse aggregate, as measured by the abrasion test, and the strength of the concrete.

Gueses of the Monolith Portland Midwest Co. attending the formal opening of the Laramie, Wyo., mill.

Formal Opening of Monolith Portland Midwest Co.'s Laramie Mill

Laramie, Wyoming, Entertains Pacific Coast Visitors in True Western Style

ON Saturday, June 22, a party of 65 officials and stockholders of the Monolith Portland Midwest Co., headed by Carroll A. Low, vice-president of the Monolith Portland Midwest Co. and the Monolith Portland Cement Co. of Monolith, Calif., were guests of the city of Laramie while attending the official opening of the company's new plant at that city. Other executive officers of the company in the party were: W. D. Burnett, general attorney for both companies; T. R. Larson, assistant to the president; W. A. Gillette, traffic department, and Peter Feister, advertising manager. Ross Grant, industrial editor of the *Los Angeles Times*, also accompanied the party. Coy Burnett, president of the Monolith companies, was unable to be present.

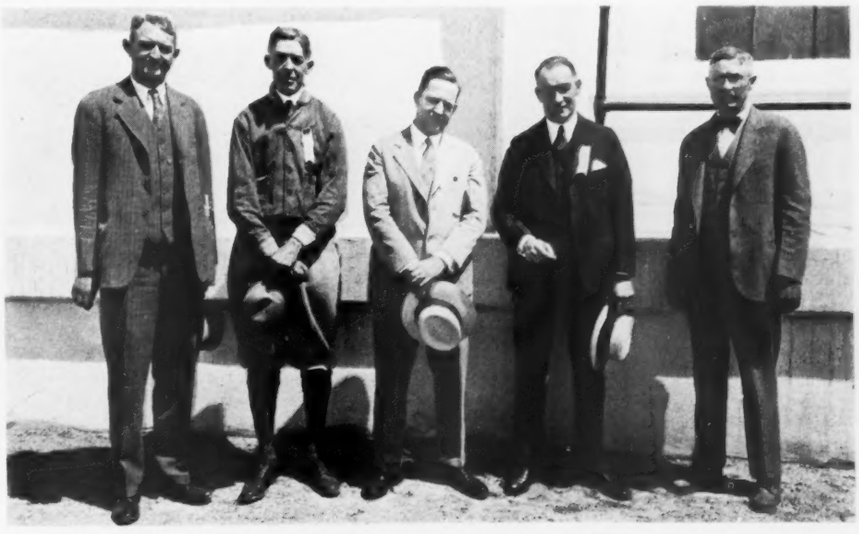
The parent company of the Monolith Portland Midwest Co., Laramie, Wyo., has developed in the last few years into one of the most successful organizations of its kind in the United States and has until the past year centralized its operations at Monolith, Calif. Stock ownership had been confined to only a few people until in 1923 a portion of the capital stock was sold to the public. The cooperation of the large number of stockholders has been one of the essential factors in the success of the company.

With this new policy of a public-owned stock corporation as a secure foundation for further expansions, the organizers of the parent company acquired a large acreage of limestone a few miles from Laramie, Wyo., and in 1928 started construction of a second portland cement plant near that city. The new operation is a subsidiary of the California company and is known as the Monolith Portland Midwest Co. It was for the formal opening that the party met at Laramie.

Special Train Carries Visitors

A special train carrying the officials of the company and stockholders left Los Angeles on June 20 and arrived at Laramie at 6:30 a. m., June 22, where they were met by citizens of Laramie, headed by Stanley Edwards, secretary of the Laramie Council of Industry. The party was representative of the entire west coast, there being delegations from Los Angeles, San Diego, Pasadena, San Jose, Calif., the Bay district of Oakland and San Francisco and Portland.

At 9:30 a. m. the incoming party joined with and met the many stockholders residing in Colorado and Wyoming, and all were taken in autos supplied by the citizens of Laramie to the new plant, which is three



Left to right: S. D. Clinton, resident manager for district, Denver, Colo.; H. C. Gardner, general director of sales, security department; W. D. Burnett, general attorney for all Monolith companies; C. A. Low, vice-president and general manager of all Monolith companies, and F. J. Anderson, plant superintendent of Laramie operation

miles southwest of town. The officials of the company and the various delegations, after being photographed, made a two-hour inspection of the new plant which, incidentally, is one of the neatest and well-designed plants that a ROCK PRODUCTS editor has had the privilege of inspecting. Not only is its arrangement and surroundings pleasing to the eye, but the plant is capable of operations in an economic sense to make it one of the outstanding plants of the United States.

Since ROCK PRODUCTS will publish a complete description of this plant at an early date, it suffices here to say that the visitors were shown the primary crushing plant with its 36-in. Traylor gyratory crusher and secondary Pennsylvania hammer mill, the 343-ft. "Unax" kiln, which is one of the longest in the world, the raw and clinker "Unidan" mills with the latest "Symmetro" drives. The latter are products of F. L. Smidth and Co., who designed the plant, supplied most of the equipment and supervised the construction. The actual construction was by the Macdonald Engineering Co. of Chicago. The visitors were also shown the operation of the many Fuller-Kinyon pumps that feature this plant, the sacking machines, etc., and all were highly pleased with the plant.

Sightseeing Tour

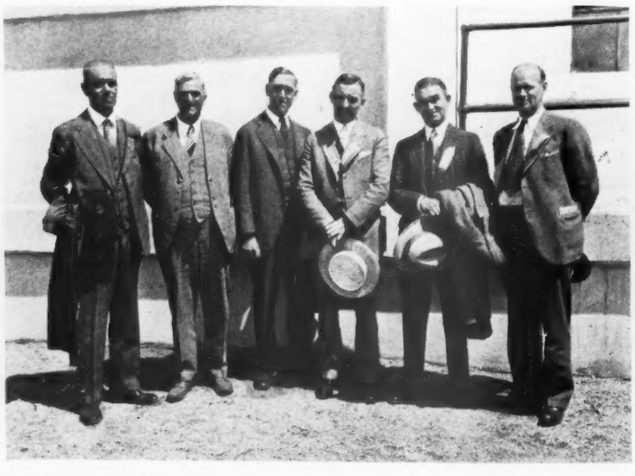
After the plant inspection, the party was taken by auto for a 135-mile trip up into the Snowy Range, the name given that portion of the Rocky Mountains some 40 miles west of Laramie. Leaving Laramie, the party traveled over a typical western prairie via a dirt road, but nevertheless a good road for a distance of 30 miles, crossing the old historical overland trail, to finally get to the old mining settlement of Centennial, now only a memory as far as mining is concerned. At this old camp the trail narrowed and the long climb up the steep, tortuous road to the Snowy Mountain camp began. The road there follows the Little Laramie river with its many waterfalls and rapids passing through a district of intense scenic interest —a district that would delight the heart of the hunter and fisherman. When an elevation of 10,000 ft. had been reached, the visitors saw banks of snow, in many places 6 to 8 ft. thick, through which the trail very recently had been opened up by shoveling the snow to one side. Soon after reaching the snow line the party arrived at the summer camp of the University of Wyoming, where all the 144 guests of the Monolith Portland Midwest Co. and the Laramie Council of Industry had luncheon.

The summer camp above mentioned is maintained primarily for summer courses in geology, botany, etc., by the University of Wyoming, and is a mountain camp of unusual interest with its cook shack "ala-western" style, the numerous tents for student quarters all nested in a growth of pine and aspen trees, with a mountain stream flowing through the camp and banks of snow everywhere—which were invitations for several free-for-all's.

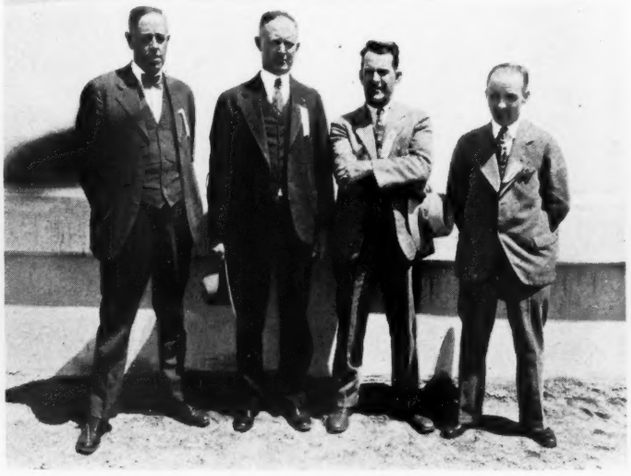
The return trip was made for the most part over a different route, affording the visitors a better idea of the scenic beauties of the district, the road followed finally bringing the party to the limestone quarry of the cement company, which is located about nine miles southwest of the plant. This remarkable deposit is a natural cement rock and requires no clay or silica for blending purposes, nor is any blasting required. The limestone is in such a shattered condition that after stripping off the few feet of overburden a power shovel can easily dig out the stone.

After inspecting the quarry, the party boarded a special train and returned to the plant over the rails of the Laramie Valley railroad. This railroad is owned by the Monolith Portland Midwest Co., but owing to the necessity of having to instigate condemnation proceedings on lands over which the railroad had to pass to reach the deposit, a separate company was organized to

Pasadena group, left to right: T. L. McCullough, W. S. Larson, W. L. Craven, W. P. True, W. Jackson, W. H. Hooper, B. Kohlmeier, Ben C. Kohlmeier

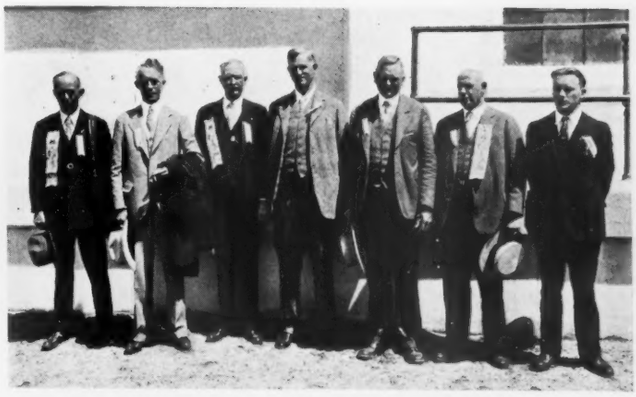


Portland, Ore., group, left to right: H. Elliott, C. A. Butterfield, G. A. Paine, E. G. Collins, Dan Watt, C. D. Nordstrup



San Jose group, left to right: W. M. Tennant, W. J. Harrison, R. J. Nash, H. W. Willson

San Francisco and Bay District group, left to right: J. A. Seferth, W. T. Strout, O. Bradley, W. H. Bradley, M. W. Cardwell, J. J. Stanton, Dr. C. B. Hobrecht, G. P. Hobrecht



San Diego group, left to right: F. W. Stewart, H. Markwardt, H. J. Hunter, H. D. Allen, C. E. Ferguson, B. Cleary, K. Hillman

handle the transportation problems. Incidentally, history was made by this train, as it was the first passenger train to pass over the rails of the Laramie Valley railroad.

The special train on arriving at the plant was again met by the autos and the party taken back to Laramie, where the members held informal good-fellowship sessions in the various hotels until 3 a. m., June 23, when the special train returned to Cheyenne for a two-hour city inspection tour. After leaving Cheyenne, the party visited Denver and Colorado Springs, reaching Salt Lake City via the Royal Gorge, and from Salt Lake returned to Los Angeles, arriving there at 9:10 a. m., June 26.

As an example of the progressive spirit of the Monolith company, particularly rewards for meritorious service and salesmanship, several of the company's branch managers and salesmen made this trip at the expense of the company. The stockholders paid their own railroad and Pullman fares, but the Monolith Portland Midwest Co. supplied all the meals.

Visiting Guests

The visiting guests attending the formal opening were:

Harry Allen, H. Anderson, Mr. and Mrs. W. S. Barnette, Oakley Bradley, W. H. Bradley, Mr. and Mrs. W. D. Burnett, C. A. Butterfield, C. A. Cardwell, B. Cleary, S. D. Clinton, E. G. Collins, W. H. Cooper, W. L. Craver, J. W. Dillard, Dr. and Mrs. J. J. Drake, E. R. Durfee, H. Elliott, C. B. Ferguson, Donald S. Gardner, H. C. Gardner, Waldo A. Gillette, Ross Grant, W. J. Harrison, William Heath, K. Hillman, Charles A. Hobrecht, G. P. Hobrecht, W. J. Hooper, H. J. Hunter, W. Jackson, B. Kohlmeir, Ben C. Kohlmeir, T. R. Larson, W. S. Larson, W. B. Lenhart, Carroll Low T. L. McCullough, Wallace Malcomb, M. N. Mansfield, Henry Marckwardt, H. J. Mullins, R. J. Nash, C. D. Nordstrup, Y. A. Paine, Samuel S. Patrick, H. O. Planck, W. F. Schuette, J. A. Seferth, George F. Sheran, Albert Shoemaker, W. F. Smith, J. T. Stanton, F. W. Stewart, William Y. Stewart, W. T. Strout, W. M. Tennant, Y. P. Thiebault, W. P. True, E. Greg Truelson, D. Watt, Mrs. Antoinette Whilson, E. L. Wilder, H. W. Wilson.

A New British Cement Factory

THE DEMAND for high-class portland cement is becoming more insistent and users will be interested in the modern cement works now rapidly nearing completion at Ketton, Rutland, England. Messrs. Thos. W. Ward, Ltd., Sheffield, whose activities in the iron, steel and constructional trades are well known, have a controlling interest in the Ketton Portland Cement Co., Ltd., which has acquired an estate in Rutland of 1174 acres, including the famous Ketton Oolitic Freestone Quarries, and by July the works will be manufacturing high grade portland cement at the rate of 60,000 tons per year.

From the Ketton Quarries stone has been taken for centuries and used in such buildings as the Tower of London, St. Dunstan's, Lambeth Palace and many of the ancient buildings at Cambridge and in the more modern Peterborough and Ely cathedrals. The stonework at Sandringham House also came from these quarries. The Ketton oolitic limestone and clays have proved ideal raw materials for cement when mixed in the right proportion and the supplies are almost inexhaustible and can be easily worked.

A well known firm of consulting engineers and experts in cement machinery is responsible for the erection of the plant and it is anticipated that the production stage will be reached by June and supplies of cement will be available in July.

The new cement, which is to be marketed as "Ketco" brand, will meet fully the soundness and chemical tests of the British standard specification. It has a high tensile strength with great resistance to compression and crushing. Uniformity of quality, the real test of portland cement, will be assured by the use of specially designed machinery working with the best raw materials obtainable.

The new company has a share capital of £300,000 divided into 200,000 ordinary shares of £1 each, and 100,000 7½ participating preference shares of £1 each. The ordinary shares have all been privately subscribed.—*The Quarry and Surveyor and Contractors' Journal.*

Los Angeles office staff with party, left to right: O. Plang, C. B. Nordstrup, W. F. Schuette, E. L. Wilder, Mrs. Antoinette Whitson, Mrs. J. J. Drake, Dr. J. J. Drake, A. Schoemaker, E. K. Redpath, W. S. Barnette, Mrs. W. S. Barnette, William Heath

Foreign Abstracts and Patent Review

Storage of Cement—The question of cement and its effect upon the qualitative characteristics is a matter of interest to the cement manufacturer as well as to the distributor and consumer, states Viktor Baehrner. According to researches of "Cementa" in their laboratory in Limhamn, Sweden, the storage of cement in sheds or silos affects different kinds of cements differently and affects each kind of cement differently in respect to its age. In referenec to new cement in storage in sheds, the percentage of compressive strength acquired the average figure of 93 and 87 in 3 and 6 months of storage, respectively; the tensile strength was influenced less by the storage than the compressive strength; and the setting period was prolonged to an unimportant degree. A cement may be stored twice as long in a *good storage* as in a cement shed without reduction of strength, whereas it may be stored for years in the silos of the cement plant.—*Zement* (1928) **17,** 43, pp. 1556-1559.

The Determination of the Quantity of Cement in a Sample of Mortar or Concrete—The method according to Hentschel starts from the determination of the soluble silicic acid contained in the cement and concrete. This is carried out as follows: A test sample is weighed, placed in water and steamed; then it is heated for a period with a soda solution of average concentration and then filtered. The residue, containing the soluble SiO_2 in the form of a Na salt, is dissolved with hydrochloric acid and again steamed. Then it is placed in water and some HCl, and the soluble silicic acid determined quantitatively. If one has determined, for example, 20% of soluble SiO_2 in the cement and 0.1 g. in 2 g. of concrete, then the result is that the concrete contained 0.5 g. cement and was therefore mixed in 1:3. The aggregates are figured in general according to the equation:

$$B - \frac{a \times 100}{b}$$

$$\frac{a \times 100}{b}$$

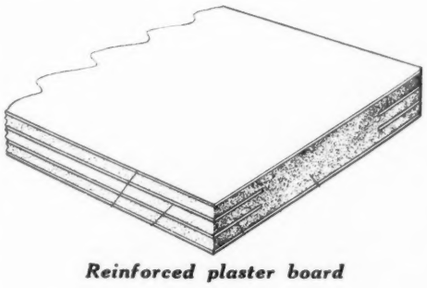
in which B is the weighed quantity of concrete, a the soluble SiO_2 determined in B, and b the content of soluble SiO_2 in cement in per cent. The method of Prof. Cramer differentiates, in contrast, between concretes in which the aggregates are acid-soluble, or soluble. In the first case it suffices to determine the soluble and the insoluble constituents and also the loss on ignition; whereby from the relation of the insoluble and soluble constituents the direct composition is obtained. In the other case the composition must be determined mathematically from the analysis of cement, aggregates and concrete. Finally, D. Florentin has in 1926 suggested the methods which follow: 1 g. of cement or 4 g. of mortar is dissolved in 50 to 60 c.cm. of cold hydrochloric acid (specific gravity 1.12), at 15 deg. C. (59 deg. F.), after which it is filtered off and the silicic acid determined by steaming by known method. If a small amount of SiO_2 is precipitated, the residue is treated with a 5% soda solution, and this solution obtained is combined with the filtrate.—*Revue des Materiaux de Construction et de Travaux Publics* (1928), 223, pp. 147-148.

Lime Deposits and the Lime Industry in the Sierra de Cordoba, Argentine—There are enormous deposits of lime in Argentina, but most of the fuel must be imported or hauled for long distances. The lime industry is concentrated almost exclusively to the entrance of the Sierra de Cordoba in Central Argentina, a mountain range extending in four sub-ranges 510 km. N.-S. and 140 km, E.-W., with a maximum altitude of 2373 m. The lime is deposited almost entirely in the palaeozoic strata in the form of lentils, stratums and seams mostly crystalline. The geology of the lime deposits is described under the headings of: Limes without noteworthy changes; crystalline limes (marble); limes interspersed with seams of aciduous eruptive stones such as aplite, pegmatite and fine-grained granite; and limes interspersed with seams of basic eruptive stone such as lamprophyre and fine-grained diorite. (See Dr. Beder: "Las Cales Cristalino-Granulosas de la Sierra de Cordoba y sus Fenomenos de Contacto," Buenos Aires, 1913.) The lime deposits of the Sierra de Cordoba have been worked for a long time, the product being shipped as far as Buenos Aires. However, the quality of the burned lime fluctuates much due to the irregularity of the raw material. The coarse crystalline lime decomposes easily in the kiln, thereby producing a dangerous quantity of dust or powdered lime, clogging the kiln with it; and the powdered lime absorbs water easily, so that it cannot withstand an extended storage or transport. No less detrimental is the fluctuating content of magnesium carbonate which amounts often to as much as 20%. Due to the very irregular distribution of the dolomitic lime in the mines, a sorting could hardly be considered; and since there is no scientific operating control of any kind to determine this dangerous content of $MgCO_3$ before the kiln is fed, the harm being done does not appear until the lime is slaked. However, a practiced eye can distinguish pure limes from dolomitic limes, for the pure lime has always a smooth surface since the weathering attacks all constituent parts uniformly. But the surface of the dolomitic limes is always rough, since the solubility of the various limes varies much. Mining of the lime is still carried on with out-of-date methods and equipment, although a few larger plants use compressed airs to drill the blast holes. There is a good future for the lime industry of the Sierra de Cordoba, though at present conditions look rather unfavorable. Foods are high-priced, labor is poor, cheap and illiterate. The employer supplies all tools which must be kept intact by the employe. There are no legal contracts nor protection of labor; 50% of the labor is native and most of the remainder Italian, and a fundamental change of the engineering and operating methods is urgently needed. A thorough study of the deposits and a good financing are necessary preparatory to an extensive working of the deposits. The operations of the plants should be controlled technically and the feeding of the kilns should be regulated chemically to assure a uniform product. It is also recommended to provide the kilns with oil firing due to the shortage of wood and the excessive costs of coal.—*Tonindustrie-Zeitung* (1928) **52,** 69, pp. 1406-1408.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired

Reinforced Plaster Board—This patent covers a method of preventing crumbling of the edges of gypsum wallboard by strengthening the edge with additional strips of

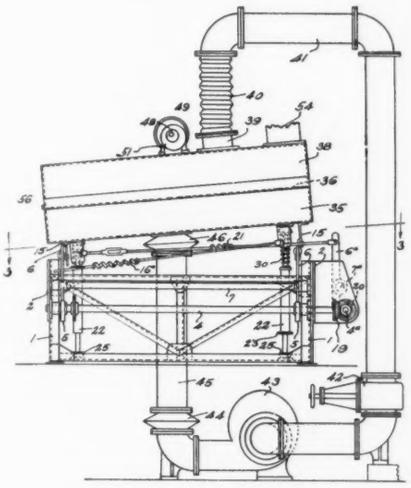


Reinforced plaster board

paper similar to that used for the bottom and cover sheet. The illustration shows how the author proposes to do this. This patent application filed in 1921 and letters of patent granted April 30, 1929.—*Charles R. Birdsey, assignor to the United States Gypsum Co.* U. S. Patent No. 1,710,915.

Dry Separator—The device consists of a riffled table in a closed box which is in closed circuit with a current of air from a

fan. The air passes through the table, which is of perforated plate, from below, lifting the particles as they are freed from contact with the table by vertical reciprocating motions. This causes stratification, the heavier particles staying down in the riffles of the table. They are worked across the table by a horizontal reciprocating motion, faster on

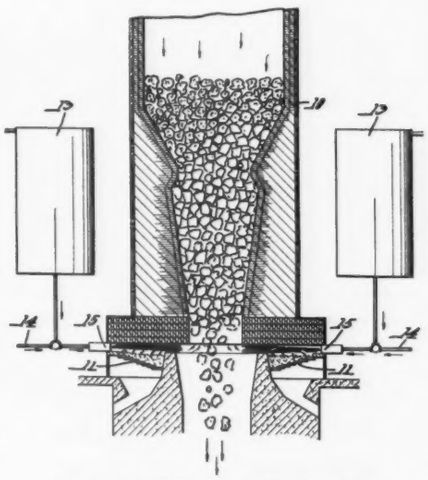


Air separator for dry materials

the forward than the return stroke so as to propel the particles in the riffles forward with a jerk. The lighter particles flow over the tops of the riffles and down to one side by gravity, provided for by the slant of the table. The air in the fan circuit is saturated with dust all the time so that even the finest particles are discharged with the lighter material and a dust collector is not needed. Reciprocating motion of the table horizontally is given by a shaft with cams working against rocker arms; vertical reciprocating motion is from a separate motor and shaft with eccentrics on top of the box enclosing the table, and a third motor drives the fan. —*M. J. Lide.* February 12, 1929. Patent No. 1,701,624.

Quartz Cement—This cement may be obtained by mixing in a very intimate manner, slow setting portland cement with acidic rocks rich in alkalies. Examples of such rocks are the porphyrys, syenites, granites, pegmatites, etc. The acid rocks and the portland cement must be thoroughly pulverized, it being recommended that they should be reduced to a degree of fineness three times greater than that usually obtained for ordinary portland cement. By grinding extremely fine and intimately mixing the two ingredients of this cement, the patentee claims that a cement is obtained of extreme denseness, hardness and strength, as well as great durability, cohesion and adherence. The patentee states as these rocks contain quartz, feldspar and mica that during the setting reactions the alkalies are liberated, the lime becomes fixed and the gelatinous silica formed contributes to form a self-vitrifying product. When used, the physical properties of this cement such as hardness, tensile strength, compression strengths, etc., gradually increase, continuing for an indefinitely long period of time and not becoming stable in two to three months, as is the case with ordinary portland cement.—*Celso Pietro Baccovich,* U. S. Patent No. 1,696,899.

Process of Calcining Lime—The principal object of this invention is to provide a convenient and inexpensive way to remove certain impurities in the products of combustion, such as sulphur, which cause deterioration of the lime. This process consists of introducing into the lower part of the kiln of furnace, preferably under steam or air pressure, in such proportions as may be



Improved kiln for calcining lime

required, a material for reacting with the sulphur dioxide before the calcining process starts and thus removing these objectionable impurities. The inventors prefer to use a mixture of water with oxide (hydrate) of lime or other alkaline earth. This is introduced in a wide thin spray of liquid, or in the form of a gaseous mixture of a dry dust. Whichever way the reagent is introduced it produces a reaction which takes out practically all the sulphur of the combustion gases, as well as some other impurities, it is claimed. The precipitate of sulphur and other impurities is taken care of in any desired way, as by drawing it out at the side. The process can be carried out in any kind of a lime kiln. It can also be used in the manufacture of face brick or of other products on which sulphur in the fuel has a detrimental effect.—*Kissag M. Nahikian, Robert W. Foster and Edgar T. Belden, assignors to Brewer and Co., Worcester, Mass.* U. S. Patent No. 1,709,226.

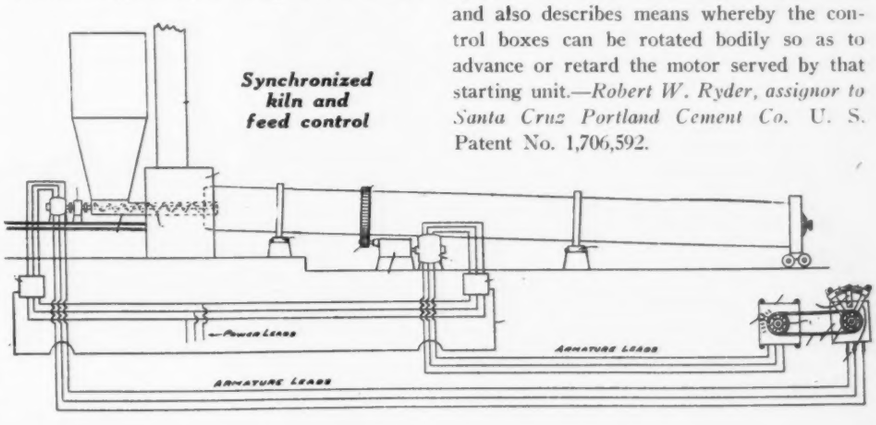
Lightweight Ceramic Material—The old principle much used in the manufacture of lightweight gypsum products, consisting of the addition of a foam to the stucco, is in this patent extended to cover a method of preparing a lightweight ceramic material. The ceramic material can be cast into special shapes or can be adopted for a method of producing lightweight aggregates. The process consists of preparing a foam by dispersing air into a solution composed of three-quarters of one part of powdered soap bark and 100 parts of water. The amount of foam used is about five parts of foam by volume to one part finely ground shale previously mixed with water. This mixture will give a product having a weight of 30 lb. per cu. ft. The mixture after drying is burned as for ceramic ware or crushed for preparation of lightweight aggregate.—*Richard Erickson, assignor to United States Gypsum Co.,* U. S. Patent No. 1,702,076.

Gypsum Insulating Material — Starch material is converted into an aqueous paste by agitating and heating e. g., to 87 deg., and the paste is mixed with 0.5% of sulphuric acid and transferred to a lead-lined storage tank whence it is mixed continuously with comminuted calcined gypsum containing 10-12% of carbonates, silicates, or similar impurities. The plastic mixture may be discharged direct on to the surface of paper liners for the production of wallboard.—*U. S. Patent No.* 1,702,729.

Cement Kiln and Feeder Control—The patentee describes his method of synchronizing the rotation of a cement kiln with the cement feeding mechanism by attaching suitable sprockets to the control boxes of each variable speed motor and connecting them by a suitable chain. By varying the speed of one motor through this hookup, the speed of the other motor is proportionately varied.

The patentee also provides for these sprockets to be of the same or different sizes and also describes means whereby the control boxes can be rotated bodily so as to advance or retard the motor served by that starting unit.—*Robert W. Ryder, assignor to Santa Cruz Portland Cement Co.* U. S. Patent No. 1,706,592.

Synchronized kiln and feed control



Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended June 1	Limestone Flux Week ended June 8	Sand, Stone and Gravel Week ended June 1	Sand, Stone and Gravel Week ended June 8
Eastern	4,442	4,348	13,995	17,410
Allegheny	3,576	4,417	8,099	10,106
Pocahontas	526	521	1,189	1,301
Southern	685	630	9,418	9,790
Northwestern	1,429	1,612	7,741	9,085
Central Western	532	474	11,510	11,951
Southwestern	497	517	6,011	6,275
Total	11,687	12,519	57,963	65,918

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

District	Limestone Flux 1928 Period to date June 9	Limestone Flux 1929 Period to date June 8	Sand, Stone and Gravel 1928 Period to date June 9	Sand, Stone and Gravel 1929 Period to date June 8
Eastern	55,892	66,877	142,203	144,279
Allegheny	69,805	73,113	114,866	104,239
Pocahontas	8,125	7,539	16,269	14,781
Southern	12,661	11,030	224,270	178,942
Northwestern	22,420	20,880	99,010	82,651
Central Western	9,146	11,844	185,403	177,032
Southwestern	9,434	10,070	120,449	124,215
Total	187,483	201,353	902,470	826,139

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	1929
Limestone flux	***187,483***	***201,353***
Sand, stone, gravel	***902,470***	***826,139***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning June 29:

SOUTHWESTERN FREIGHT BUREAU DOCKET

17756. To establish the following distance scale of rates for application from Garnett, Price and Tulsa, Okla., and intermediate points, to points in Arkansas on the C. R. I. & P. Ry., K. C. S. Ry., Ft. S. & W. Ry., M. V. R. R., Mo. Pac. R. R., St. L.-S. F. Ry. and St. L. S. W. Ry., on the following commodities:

Gravel; rip rap; sand, except asbestos sand; stone, crushed, including ground limestone.

In straight or mixed carloads. Minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb., marked capacity will govern.

Miles		Rate Single Line	Rate Joint Line
5 and under		3	3½
10 and over	5	3	3½
15 and over	10	3	3½
20 and over	15	3	3½
25 and over	20	3½	4
30 and over	25	3½	4
35 and over	30	3½	4
40 and over	35	3½	4
45 and over	40	4	5
50 and over	45	4	5
55 and over	50	4	5
60 and over	55	4	5
65 and over	60	5	5½
70 and over	65	5	5½
75 and over	70	5	5½
80 and over	75	5	5½
85 and over	80	5½	6½
90 and over	85	5½	6½
95 and over	90	5½	6½
100 and over	95	5½	6½
105 and over	100	5½	7
110 and over	105	5½	7
115 and over	110	6½	7
120 and over	115	6½	7
125 and over	120	6½	7
130 and over	125	6½	7
135 and over	130	7	7
140 and over	135	7	7
145 and over	140	7	7
150 and over	145	7	7
160 and over	150	7	8
170 and over	160	7	8
180 and over	170	8	8½
190 and over	180	8	8½
200 and over	190	8	8½
210 and over	200	8	9
220 and over	210	8	9
230 and over	220	8½	10
240 and over	230	8½	10
250 and over	240	8½	10
260 and over	250	9	10
280 and over	260	10	10½
300 and over	280	10	10½
320 and over	300	10½	11
340 and over	320	10½	11
360 and over	340	11½	12
380 and over	360	11½	12
400 and over	380	11½	12
425 and over	400	12	12½
450 and over	425	12	12½
475 and over	450	13½	13½
500 and over	475	13½	13½
525 and over	500	14½	14½
550 and over	525	14½	14½
575 and over	550	15½	15½
600 and over	575	15½	15½

Shippers have requested a reasonable line of rates from Garnett, Price and Tulsa, Okla., and intermediate points. The scale shown below is the 9702 sand and gravel scale. The 9702 scale has been put in as specific rates from Oklahoma to Southwest Missouri and Northeast Arkansas points, and it is felt that the 9702 scale is proper for application between these points.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

17774. **Agricultural limestone trains,** from, to and between points in the southwest. To establish a flat handling charge of $7 per car in connection with stopping in transit of agricultural limestone trains, same to be applied in addition to the regular published freight rates, from, to and between points in Southwestern Freight Bureau territory. It is pointed out that there is no published charge covering this movement and various charges are applied by the operating departments of the different lines involved, and the above basis is suggested, which it is felt is reasonable.

SOUTHERN FREIGHT ASSOCIATION DOCKET

45972. **Limestone, ground or pulverized,** from producing points on S. A. L. Ry. and connections to stations on the S. A. L. Ry., C. M. & C. R. R., C. & L. R. R., R. & C., R. R., and M. & S. R. R. It is proposed to revise rates on ground or pulverized limestone, carloads, from all producing points on the S. A. L. Ry. and its connections, except producing points in Virginia on the C. & O. Ry., N. & W. Ry., Southern Ry., and Virginian Ry., to stations on the S. A. L. Ry., C. M. & C. R. R., C. & L. R. R., R. & C. R. R. and M. & S. R. R., except to points in Florida south of the line of the S. A. L. Ry., Jacksonville to River Junction, Fla., on basis of the same scale as prescribed by the Interstate Commerce Commission from points in Virginia in Docket No. 19943, April 1, 1929. Statement of present and proposed rates from and to representative points will be furnished upon request.

45996. **Limestone, ground or pulverized,** between stations on the S. A. L. Ry., etc. It is proposed to revise the local mileage rates on ground or pulverized limestone, carloads, between points on the S. A. L. Ry., except interior Florida points, interstate and intrastate, on basis of the scale prescribed by the Interstate Commerce Commission in Docket No. 19943, dated April 1, 1929; and to and between points on the C. & L. R. R., C. M. & C. R. R., R. & C. R. R., and M. & S. R. R., on basis of the scale referred to, plus relief line arbitrary of 25c per net ton.

46061. **Molding sand** from Newport Sand Bank Co. Spur, Ind., to southeastern points. It is proposed to amend Agent Speiden's Origin Basis Book 39J, I. C. C. 1157, by providing that rates on molding sand, carloads, from New Albany, Ind., to southeastern points will also apply from Newport Sand Bank Co.'s Spur, Ind.

45882. **Stone** from Rocky Point, Indian Rock and Eagle Mountain, Va., to Norfolk Southern R. R., Electric Div. stations. Combination basis now applies. Stone, crushed, carloads, minimum weight 100,000 lb., to Chesapeake Beach, Diamond Springs and Fox Hall, Va., 165c per net ton, same as rate to Ocean Park, Va.; to Euclid and Glen Rock, Va., 155c per net ton, same as rate to Rosemont, Va.

WESTERN TRUNK LINE DOCKET

2269F. **Sand, molding,** carloads (See Note 2) (except that when actual weight loaded to full capacity of car is less than 90% of marked capacity, actual weight will be the minimum, but not less than 40,000 lb.). Present rates in cents per cwt.; proposed rates, per ton:

From	Pres.	Prop.
Dallas City, Ill., to Ottumwa, Ia.	11	$1.30
Gladstone, Ill., to Mt. Pleasant, Ia.	7	1.00
Gladstone, Ia., to Fairfield, Ia.	7	1.15
Gladstone, Ia., to Ottumwa, Ia.	11	1.30

6925. **Sand and gravel,** carloads, as described in Items 9190 and 9200, W. T. L. Tariff 111G, from stations shown in above items located in Missouri, Illinois, Wisconsin and Minnesota, to Colorado common points as described in above items. Present rate, 34½c (See Note 2); proposed, 30c, minimum weight 100,000 lb.

2079-I. **Stone, crushed, and crushed granite,** carloads, from Montello and Waupaca, Wis., to St. Paul, Minneapolis and Minnesota Transfer, Minn. Present rates, 7c per 100 lb. on crushed granite, 12c per 100 lb. on crushed stone; proposed, 10c per 100 lb. on crushed stone and crushed granite.

1564R. **Stone, crushed,** from Dell Rapids, S. D., to Aplington, Ia. Present rate, combination on Ackley of $1.70 plus 43c beyond, total $2.13 per ton of 2000 lb.; proposed, $1.90 per ton of 2000 lb.

3089H. **Agricultural limestone** (suitable for land fertilization purposes only) (See Note 2), except that when weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will apply. In no case shall the minimum weight be less than 40,000 lb. From Weldon Springs, Mo., to points in Missouri. Present rate, 1c per ton per mile plus 24c per ton, with minimum charge of 61c per ton of 2000 lb. for each line handling in case of a two-line haul and 57c per ton of 2000 lb. for each line handling in case of a three-line haul; with combination of intermediates as a maximum, as per Items 290 and 1110, W. T. L. Tariff 91F, I. C. C. A1828. Proposed to add Weldon Springs, a local point, on the M-K-T as point of origin in Item 1105S of W.T.L. Tariff 91F.

6947. **Agricultural limestone trains.** Between point in Western Trunk Line territory, also between points in Western Trunk Line territory and Southwestern Freight Bureau territory. Present—No published charge, but various charges are made for the service of handling such trains by the operating department of the various lines. Proposed—To establish a flat handling charge in connection with agricultural limestone trains of $7 per car, same to be applied in addition to the regular published freight rates.

ILLINOIS FREIGHT ASSOCIATION DOCKET

3330. **Sand and gravel** (See Note 3), but not less than 40,000 lb., from Chillicothe, Ill., to various points in Illinois (rates in cents per net ton):

To (Representative Points)	Pres.	Prop.
Watseka, Ill.	115	101
Effner, Ill.	Class	113
Piper City, Ill.	101	88
Secor, Ill.	100	88

5083. **Sand and gravel,** carloads (See Note 3), but not less than 40,000 lb., from Afton, Janesville, Riton, Beloit, Wis., and Rockford, Ill., to Elmhurst, Ill. Present rate, $1.22 per ton; proposed, 90c.

5089. **Sand and gravel,** carloads, minimum weight 40,000 lb., from Muscatine, Ia. (rates in cents per net ton):

To	Pres.	Prop.
Belleville, Ill.	190	164
Mt. Vernon, Ill.	330	214

5092. **Silica, crude or ground,** carloads, minimum weight 60,000 lb., from Olive Branch, Ill., to Murphysboro, Ill. Rates in cents per ton of 2000 lb. Present, *95; proposed, 95c.

*Applies only on crude silica, carload.

5094. **Crushed stone, carloads,** from Linwood, Ia. Rates in cents per net ton. To Evansville, Wis., present 250, proposed 150; Ft. Atkinson and Jefferson, Wis., present 280, proposed 150.

5099. **Cinders, gravel, sand, strippings, gravel pit, strippings sand pit** (See Note 2), except that when weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity, the actual weight will apply, but in no case shall the minimum be less than 40,000 lb., from Afton, Beloit, Janesville, Wis., Rockford and South Beloit, Ill., to C. G. W. R. R. stations, Myrtle to Galena Jct., Ill., inclusive. Rates per net ton. Present, $1.03; proposed, $1.13.

CENTRAL FREIGHT ASSOCIATION DOCKET

21902. To establish on **sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica,** carloads, Mineral City, O., to destinations in C. F. A. territory, same commodity rates as in effect from Canton, O.

21903. To establish on **sand** (except blast, core, engine, filter, fire or furnace, glass, grinding or polishing, loam, molding or silica) **and gravel,** in open top cars, carloads, Anderson, Ind., to Dunreith and Spiceland, Ind., rate of 85c per net ton. Present—Sixth class rate of 210c per net ton.

21904. To establish on **gravel and sand,** carloads, Randles, O., to Cambridge, O., rate of 80c per ton of 2000 lb. Present rate—85c per ton of 2000 lb.

21907. To establish on **sand and gravel,** carloads, from Richwood, O., to points in Ohio. In cents per net ton:

To	Prop.	To	Prop.
Crestline	$0.80	Shiloh	0.90
Vernon	0.80	Greenwich	0.90
Shelby	0.85	Grafton	1.00

Present—Sixth class.

21908. To establish on **stone, crushed,** in bulk only, **crushed stone screenings,** in bulk only, carloads; **limestone, agricultural** (not ground or pulverized), in bulk, in open top cars only, carloads; **stone tailings,** carloads, from Narlo, O.

To	Miles	Pres.	Prop.
Adena, O.	160.6	$1.50	$1.40
Augusta, O.	169.6	1.40	1.35
Fairpoint, O.	197.0	1.50	1.45
Jewett, O.	147.6	1.40	1.25

21910. To establish on **sand** (except blast, core engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel,** in bulk, in open top cars, carloads, from Miamiville, O., to various destinations, rates as shown in Exhibit A. Present and proposed rates—As shown in Exhibit A.

EXHIBIT A

Proposed Adjustment—Carload Rates—Sand and Gravel From Miamiville, O.

To (Rep. Pts.) C. & O. Ry. Stas.	Present Rate	Factors To Cincinnati, O.	Factors Beyond Cincinnati, O.
Wellsburg, Ky.	125	30	105
Maysville, Ky.	155	30	105
Morehead, Ky.	195	30	175
Preston, Ky.	195	30	175
Stenstone, Ky.	195	30	175
Ewington, Ky.	195	30	175
C. N. O. & T. P. Ry. Stas.			
Devon, Ky.	88	30	55
Dry Ridge, Ky.	110	30	70
Sadieville, Ky.	122	30	80
Lexington, Ky.	150	30	100
Burgin, Ky.	150	30	110
Danville, Ky.	150	30	110
L. & N. R. R. Stas.			
Spring Lake, Ky.	90	30	50
Butler, Ky.	110	30	60
Robinson, Ky.	120	30	80
Winchester, Ky.	150	30	100
Viley, Ky.	150	30	110
Frankfort, Ky.	140	30	110
Hill Spring, Ky.	150	30	100
Simpsonville, Ky.	150	30	110
Verona, Ky.	110	30	60
Worthville, Ky.	120	30	80
Buckner, Ky.	150	30	100
Anchorage, Ky.	150	30	100

21920. To establish on **dolomite, raw or crude, and stone, fluxing** (in open top cars only), carloads, Genoa, Martin and Marblehead, O., to Dunkirk, Black Rock, Buffalo and East Buffalo, N. Y., rate of 149c per gross ton. Present—179c per gross ton.

21926. To cancel rate of $1.05 per net ton on **sand and gravel, lake, river and/or bank, slag and crushed stone,** Battle Creek, Mich., to Detroit, Mich. Upon cancellation of commodity rate the distance rate of $1.10 in accordance with Michigan Public Utilities Commission scale in Docket No. 1522 will be applicable.

21930. To establish on **molding sand,** carloads, from E. & O. V. R. R. stations. Rates in cents per ton of 2000 lb.:

To	Pres.	Prop.
Des Moines, Ia.	$4.11	$3.90
Red Oak, Ia.	4.11	3.90
Le Mars, Ia.	4.55	4.00
Sioux City, Ia.	4.58	4.00

21936. To establish on **sand, core,** carloads, from St. Charles, Mich., to Vassar, Mich., rate of 88c per net ton. Present rate, sixth class, 240c per net ton.

21937. To establish on **sand and gravel,** carloads, Vincennes, Ind., to New Albany, Ind., rate of $1.25 per net ton. Present rate, $1.73 per net ton.

21938. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel,** carloads, Wolcottville, Ind., to Bluffton, Ind., via Nickel Plate road, rate of 95c per net ton. Present rate, 270c per net ton (sixth class).

21939. To establish on **crushed stone,** carloads, Putnamville, Ind. (Indiana State Penal Farm), to Helmsburg, Ind., rate of $1.05. Present rate, sixth class.

21940. To establish on **crushed stone,** carloads, Greencastle, Ind., to Harrison, Ind., rate of 115c per net ton. Present rate, 126c per net ton.

21941. To establish on **sand and gravel,** carloads, Lafayette, Ind., to Advance, Ind., rate of 85c per net ton. Route—Via C. C. C. & St. L. Ry., Lebanon, Ind., and Central Indiana Ry. Present rate, sixth class.

21945. To establish on **crushed stone,** carloads, Greencastle, Ind., to Michigantown, Ind., rate of 95c. Present rate, sixth class.

21972. To revise rates on **high grade sand** from Ellwood Jct., West Ellwood Jct., Beaver, Vanport, etc., to points in Central Freight Association and Trunk Line Association territories in Ohio, Pennsylvania and West Virginia, as illustrated in Exhibit A.

EXHIBIT A

From West Elwood Jct. (P&LE)
Ellwood Jct. (PRR)

Illustrations To	Present Rate P&LE	PRR	Prop. Rate
Akron, O.	140	151	151
Belle Vernon, Penn.	140	189	189
Bradford, Penn.	160	.....	189
Cleveland, O.	140	151	151
Ellwood City, Penn.	60	.....	76
Girard, O.	88	101	88
Leckrone, O.	160	227	227
Monessen, O.	140	151	151
Orrville, O.	140	151	151
Randall, W. Va.	185	.....	202
Sharon, Penn.	80	88	88
Walford, Penn.	80	88	88
Williamsfield, O.	101	.....	139

From Beaver, Penn. (P&LE)
Vanport, Penn. (PRR)

Illustrations To	Present Rate P&LE	PRR	Prop. Rate
Akron, O.	140	151	151
Belle Vernon, Penn.	115	.....	126
Bradford, Penn.	.....	.....	.....
Cleveland, O.	.....	151	151
Ellwood City, Penn.	70	76	76
Girard, O.	.....	.....	.....
Leckrone, O.	140	.....	151
Monessen, O.	115	.....	126
Orrville, O.	.....	151	151
Randall, W. Va.	140	.....	151
Sharon, Penn.	90	101	101
Walford, Penn.	90	101	101
Williamsfield, O.	.....	.....	.....

From Edenburg, Penn. (P&LE)
Edenburg, Penn. (PRR)

Illustrations To	Present Rate P&LE	PRR	Prop. Rate
Akron, O.	126	126	139
Belle Vernon, Penn.	189	202	189
Bradford, Penn.	.....	.....	.....
Cleveland, O.	126	126	139
Ellwood City, Penn.	76	.....	76
Girard, O.	88	.....	88
Leckrone, O.	202	.....	227
Monessen, O.	189	.....	176
Orrville, O.	139	126	139
Randall, W. Va.	214	.....	227
Sharon, Penn.	76	76	76
Walford, Penn.	76	76	76
Williamsfield, O.	101	126	101

From Youngstown, O. (P&LE)
Youngstown, O. (PRR)

Illustrations To	Present Rate P&LE	PRR	Prop. Rate
Akron, O.	.....	.....	.....
Belle Vernon, Penn.	189	.....	189
Bradford, Penn.	.....	.....	.....
Cleveland, O.	.....	.....	.....
Ellwood City, Penn.	88	.....	88
Girard, O.	.....	.....	.....
Leckrone, O.	205	.....	227
Monessen, O.	189	.....	176
Orrville, O.	.....	.....	.....
Randall, W. Va.	214	.....	227
Sharon, Penn.	76	76	76
Walford, Penn.	80	76	76
Williamsfield, O.	.....	.....	.....

TRUNK LINE ASSOCIATION DOCKET

17097. **Limestone, broken (quarry waste),** from Danbury, Conn., to Glenwood and Medford, Mass. Present, 16c; proposed, 21½c. Reason—Rate is not being used—obsolete.

17105. **Limestone,** minimum weight 40,000 lb., from Cheshire, Dalton, Farnams, North Adams, Renfrew, Richmond and Zylonite, Mass., to all stations on the C. V. Ry. Present 16c to south divisions, class rates to other points. Proposed, limestone, 15½c. Reason—To equalize rates from competitive producing points.

21080. **Sand, common or building, and gravel,** carloads (See Note 2), from Ballina, N. Y., to Randallsville, N. Y., $1 per net ton (present rate $1.10 per net ton). Reason—Proposed rate is fairly comparable with rates on like commodities from and to points in the same general territory.

21081. **Sand, building, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Tatesville, Penn., to Pittsburgh, New Kensington, Monongahela City, Jeanette, Springdale, Butler, Belle Vernon and Connellsville, Penn., $1.95 per net ton (present rate $2.20 per net ton). Reason—Proposed rates are fairly comparable with rates from the Berkeley Springs-Hancock district and from Mapleton district to the same destinations.

M1179. **Crushed stone, quarry waste and refuse,** from Bittinger, Penn., to New Oxford, Va., $20 per car, and to Brush Run, Penn., $22.50 per car, in 10-car lots. Rates to expire December 31, 1929. Reason—To meet motor truck competition.

21090. **Limestone screenings,** carloads (See Note 2), from Atlas, Hamburg and Lime Crest, N. J., to points on the Erie R. R. and N. Y. S. & W. R. R. Rates per net ton:

Erie R. R.	Prop.	Pres.
Jersey City, N. J. (local)	$1.27	$1.50
Weehawken, N. J.	1.27	1.50
Arlington, N. J.	1.27	1.40
Orange, N. J.	1.27	1.30
Montclair, N. J.	1.15	1.30
Verona, N. J.	1.15	1.40
Essex Falls, N. J.	1.15	1.40
Pompton, N. J.	1.14	1.30
Newark, N. J.	1.27	1.40
Paterson, N. J.	1.14	1.30
Ridgewood, N. J.	1.27	.....
Allendale, N. J.	1.27	1.40
Suffern, N. Y.	1.25	1.40
Tuxedo, N. Y.	1.25	1.40
Middletown, N. Y.	1.05	1.40
N. Y. S. & W. R. R.		
Edgewater, N. J.	1.27	1.40
Paterson, N. J.	1.14	1.30
Sussex, N. J.	1.04	1.20
Water Gap, Penn.	1.15	1.40

Reason—Proposed rates are fairly comparable with rates now in force from Ogdensburg, N. J.

21101. **Sand and gravel,** other than blast, engine, foundry, glass, molding, sea and silica, carloads (See Note 2), from Alfred, N. Y., to Grive to Angelica, N. Y., inclusive; Nile to Ceres, N. Y., inclusive, and White House and Portville, N. Y., $1 per net ton (present rate $1.10 per net ton). Reason—Proposed rates are fairly comparable with rates now in effect from Machias and Franklinville, N. Y.

21147. **Limestone screenings,** carloads (See Note 2), from Atlas, Hamburg and Lime Crest, N. J.

To	Prop.	Pres.
N. Y. Lighterage Station, N. J.	$1.27	$1.50
Hoboken, N. J.	1.27	.....
Paterson, N. J.	1.14	1.50
Newark, N. J.	1.27	1.50
Montclair, N. J.	1.27	1.50
Summit, N. J.	1.27	1.50
Gillette, N. J.	1.27	1.60
Gladstone, N. J.	1.35	1.70
Morristown, N. J.	1.15	1.40
Chester, N. J.	1.15	1.40
Johnsonburg, N. J.	1.15	1.40
Blairstown, N. J.	1.15	1.50
Hackettstown, N. J.	1.04	1.30
Washington, N. J.	1.14	1.30
Broadway, N. J.	1.20	1.40
Phillipsburg, N. J.	1.20	1.50
Nazareth, Penn.	1.35	1.50
East Stroudsburg, Penn.	1.25	1.50

Reason—Proposed rates are comparable with rates now in force on crushed stone.

20869. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Philadelphia, Penn., to Fullerton, Penn., $1.05 per net ton.

Interstate Commerce Commission Decision in Southwest Case

Stone, Gravel and Sand Rates Placed on New Mileage Basis

CONTINUING the abstract (ROCK PRODUCTS, June 22, pp. 86, 87) of the decision of the Interstate Commerce Commission, made public June 17, in regard to a rearrangement of the general freight-rate structure in the Southwest, under the authority of the Hoch-Smith act of Congress, the findings of the commission are:

1. That the interstate rates maintained by respondents in No. 17000, Part 11, on the commodities described in Appendix 1, in straight or mixed carloads, between points in Arkansas, Oklahoma, Texas and western Louisiana, and the interstate rates maintained on the same commodities, in straight or mixed carloads, by defendants in Nos. 9927, 10418 and 10419 from St. Louis and Kansas City, Mo., to points in Arkansas, and by defendants in No. 7250 from St. Louis and Kansas City, Mo., to Shreveport and Alexandria, La., are, and for the future will be, unreasonable to the extent they exceed, or may exceed, the rates set forth in Appendix 2.

Certain Rates Found To Be Unreasonable

2. That the interstate rates maintained by respondents in No. 17000, Part 11, on the commodities described in Appendix 1, in straight or mixed carloads, between points in Arkansas, Oklahoma, Texas and western Louisiana, on the one hand, and Memphis, Tenn., Vicksburg and Natchez, Miss., and Angola, Baton Rouge, Harahan and New Orleans, La., on the other hand, and the interstate rates maintained on the same commodities, in straight or mixed carloads, by respondents and defendants in No. 9702 and No. 7304, from Memphis, Tenn., to points in Missouri on and south of the line of the St. Louis-San Francisco railway running from Cape Girardeau, Mo., through Mingo, Mo., to Springfield, Mo., inclusive, are, and for the future will be, unreasonable to the extent they exceed, or may exceed those prescribed in finding No. 1, plus 6 cents per ton of 2000 lb. when to or from Memphis, and plus 8 cents per ton of 2000 lb. when to or from other named east-bank crossings.

3. That when the interstate transportation within the territory covered by findings Nos. 1 and 2 is in whole or in part over the Texas Mexican railway the rates on the commodities covered by the said findings are, and for the future will be, unreasonable to the extent they exceed, or may exceed, the rates above found reasonable for the interstate transportation of said commodities, plus an arbitrary equivalent to 20% of the rate that would be applicable under the aforesaid findings for that part of the total haul which is over the said Texas Mexican railway, such arbitrary to accrue solely to the Texas Mexican railway.

4. That the interstate rates maintained on sand, gravel and chat, as described in Appendix 1, in straight or mixed carloads, by defendants in No. 16002 from Little River Siding, Ark., and by defendants in No. 18702 from Arkansas City, Ark., to destinations in western Louisiana are, and for the future will be, unreasonable to the extent that they exceed, or may exceed, the rates set forth in Appendix 2.

5. That the intrastate rates on sand, gravel and chat, as described in Appendix 1, in straight or mixed carloads, maintained by defendants in No. 16002 and by defendants in No. 18702 from points in western Louisiana located on and north of the line of the Vicksburg, Shreveport and Pacific railway (now part of the Illinois Central system) extending from Vicksburg, Miss., to Shreveport, La., to the extent that such intrastate rates are lower, distance considered, than the corresponding rates on like traffic moving interstate from Arkansas City, Ark., and Little River Siding, Ark., to said destinations, result and will result in undue preference and advantage of western Louisiana producers and shippers in intrastate commerce and in undue prejudice to complainants shipping in interstate commerce from Arkansas points to said destinations and in unjust discrimination against interstate commerce; and that said undue preference and prejudice and unjust discrimination can and should be removed by the establishment and maintenance from said Arkansas points, on the one hand, and from said western Louisiana points, on the other, to said destinations, of rates on the basis of those found reasonable in Appendix 2.

6. That the interstate rates herein found reasonable are to be subject to a minimum weight of 90% of the marked capacity of the car, except that when car is loaded to full visible capacity actual weight shall govern.

Rates Over Shortest Routes to Apply

7. That in determining whether hauls are single line or joint line for the purpose of the application of the interstate rates herein found reasonable carriers under common control and management and operated as one system shall be regarded as one line; and in computing distances for the application of such interstate rates the shortest routes shall be used over which carload traffic can be moved without transfer of lading.

Will Apply to Intrastate Rates Except in Louisiana

The Arkansas, Oklahoma and Texas commissions, respectively, are approving the same bases of rates for intrastate application within those states as are herein approved for interstate application. The Louisiana commission has indicated its willingness to remove the undue prejudice and unjust discrimination found to exist in Nos. 16002 and 18702 by authorizing the establishment of rates from western Louisiana producing points to northern Louisiana destinations, covered by the findings in those cases, on the same basis as the interstate rates herein approved. In view of this expression on behalf of the Louisiana commission and also of the further fact that the intrastate rates within Louisiana covered by finding No. 5 are embraced within our findings and order hereinafter made in the general case, it is unnecessary at this time to enter a separate order under finding No. 5.

The Louisiana commission is not willing to authorize for application throughout that portion of Louisiana involved in No. 17000, Part 11, the interstate basis of rates herein approved. The comparatively low level of the Louisiana good-roads rates has been amply portrayed herein. Those rates move from 80 to 85% of this traffic within said portion of Louisiana and on the average are about 35% lower than the interstate rates herein approved, and the rates also approved by state authorities for application within those states grouped with Louisiana in this proceeding.

New Mileage Scale

Appendix 1. Commodity description: Sand (except asbestos sand and silica sand); gravel; crushed stone (broken stone ranging in size up to 200 lb. weight), including ground limestone, in bulk or in bags, but not including gypsum rock; riprap (irregular shaped rock) in pieces ranging up to 200 lb. weight; clay (except ground clay in bags and treated or milled fire clay); common shells, whole or crushed; crushed tile and crushed sewer pipe (imperfect hollow tile and sewer pipe crushed for use instead of crushed stone); soil; cinders; crushed bricks or brickbats; chat (mine gravel), whole or crushed, and slag, not pulverized; in bulk, in straight or mixed carloads.

Appendix 2. Distance scales of rates in cents per ton of 2000 lb. for application on commodities named in Appendix 1:

	Single-line rate	Joint-line rate
10 miles	50	65
20 miles, over 10	56	71
30 miles, over 20	62	77
40 miles, over 30	68	83
50 miles, over 40	74	89
60 miles, over 50	80	95
70 miles, over 60	85	100
80 miles, over 70	90	105
90 miles, over 80	95	110
100 miles, over 90	100	115
110 miles, over 100	105	120
120 miles, over 110	110	125
130 miles, over 120	115	130
140 miles, over 130	120	135
150 miles, over 140	125	140
160 miles, over 150	130	140
180 miles, over 170	140	150
190 miles, over 180	145	155
200 miles, over 190	150	160
230 miles, over 200	160	170
260 miles, over 230	170	180
290 miles, over 260	180	190
320 miles, over 290	190	200
350 miles, over 320	200	205
380 miles, over 350	210	215
410 miles, over 380	220	225
440 miles, over 410	230	235
470 miles, over 440	240	245
500 miles, over 470	250	250
530 miles, over 500	260	260
560 miles, over 530	270	270
590 miles, over 560	280	280
620 miles, over 590	290	290
650 miles, over 620	300	300
680 miles, over 650	310	310
710 miles, over 680	320	320
740 miles, over 710	330	330
770 miles, over 740	340	340
800 miles, over 770	350	350

Wisconsin Rate Hearing on Sand and Stone

HEARING on the investigation into the joint freight rates on sand, gravel and crushed stone, launched by the Wisconsin Railroad Commission, will be held in the office of the commission at Madison, July 29, according to notice received by R. J. Laubenstein, traffic commissioner of the association of commerce. The investigation is expected to arouse widespread interest among gravel and material men about Green Bay and other places since the publication of joint rates would create radical changes in the present status of the industry.—*Green Bay* (Wis.) *Gazette.*

Rates on Sand and Gravel

WITH only a few minor exceptions the "co-operative" effort of shipper and carrier representatives to reach an agreement as to rates on sand, gravel, and crushed stone to points in southern Illinois on and south of the line of the Pennsylvania from East St. Louis to Terre Haute was brought to a conclusion at the hearing and conference before Examiner Fuller May 27, 28 and 29. The issues involved are covered by a general investigation instituted by the Commission in docket 21939 and two interstate cases joined with that, docket 21372, Ohio and Indiana Stone Co. and others against the Big Four, and I. and S. 3093, sand gravel, and crushed stone from Indiana points to destinations in Illinois. In addition, the program includes disposition of three cases of the Illinois commission, dockets 17841, 17863, and 18480.

At the opening of the hearing there appeared to be some danger that the work of the committee appointed to work out a compromise adjustment of the rates would be lost entirely, due to insistence on the part of some of those present that certain issues be handled in the usual formal manner. On the submission of the recomendations of the committee—an 88-page rate check—for incorporation into the record, J. S. Burchmore, appearing for the Columbia Quarry Co., protested that the proceeding was not being conducted in accordance with the Commission's rules of practice. In support of his objection he outlined a series of things which he found objectionable in the "informality" in which the case had been handled, with particular emphasis on the fact that, if the rate check being offered represented a "compromise," it was not, according to law, evidence. Moreover, he said, the document was not agreed to by all parties "as shown on its face."

Additional objection to receipt of the document was offered by F. E. Webster, general freight agent, C. & E. I., who asked that it be understood that "there is no stipulation in this record on behalf of the C. & E. I."

There was, temporarily, a total absence of anything ordinarily conveyed by the term "co-operative."

Examiner Fuller took pains to explain that the length of the records being made in such proceedings as the Commission had before it was becoming a great burden to it. He referred to the fact that at the last meeting of the National Industrial Traffic League a resolution was adopted commending the conference method of handling rate disputes. The Commission had designated the instant proceeding, he said, as one in which that method should be tried. The facts were complicated and the interests of the parties diverse, he continued, but a number of strenuous sessions had been held in which, he believed, considerable progress had been made toward settlement. He asked for continued co-operation to the end that they might get in the facts, "on agreement," to the extent that was possible.

The last two days of the hearing were taken up with the submission, through witnesses, of prepared statements of facts and the receipt of formal testimony from Mr. Webster and others. The statements of facts had been requested by the Commission and covered the history of the rates from the individual producing points, plant capacity, transportation conditions surrounding the movements and other matters.

The measure of the rates from northern Illinois producing points in Illinois, such as Thornton and Lehigh, the adjustment from the East St. Louis district, and from Anna and Chasco, Ill., were some of the features on which agreement could not be reached. Under the committee recommendations, generally speaking, rates from the northern points would be increased, while the southern points would receive reductions.

Henry Christianson, of the Burlington, particularly opposed the rates suggested for application from Greencastle, Ind. They would, he said, create unjust discrimination at points on his line against Illinois shippers and Illinois traffic.

Although there were a good many contentions that were not susceptible of disposition on the conference basis, the opinion was expressed that the results of the attempt to dispose of the issues in that way were, in the main, favorable. It was pointed out that, at the conclusion of the hearing, the record consisted of only a few hundred pages, whereas, if the cases had gone to hearing in the usual manner, it probably would have amounted to as many thousands.

It was understood that a petition was to be submitted to the Illinois commission requesting that it continue to handle the cases before it co-operatively with the interstate commission. Discussion of the matter developed that it was the unanimous wish of the parties involved that that be done.

At the suggestion of Mr. Burchmore, a committee of shippers was appointed, with N. E. Kelb, Ohio and Indiana Stone Co., is chairman, to meet in Chicago soon to see if agreement could be reached with respect to the presentation of a statement, by years, of tonnage originated by the various plants, beginning with 1922. That committee was, as well, to decide as to the desirability of the submission of any additional facts to the Commission.

New Gravel Rates Asked

NEW RATES on gravel and sand from its plants at Blue Rapids, Kan., and Rody to intrastate points on the Union Pacific, Missouri Pacific and St. Joseph and Grand Island are asked by the Blue Rapids Gravel Co. in a complaint filed with the state public service commission recently.

I. C. C. Proposed Reports

20855. Cement. Reparation demand for the period between the finding of unreasonableness and the effective date ordered, in 20855 Oklahoma Portland Cement Co. vs. M.K.T. of Texas et al., and eight sub-members, by same complainant against various combinations of carriers, the examiner proposes the commission shall say that "when it becomes incumbent upon carrier to establish rates in companies with an order of this commission they cannot be expected to establish such rates contemporaneously with the mandate requiring the establishment of such rates." Therefore, the examiner has recommended that the commission find not unreasonable or unduly prejudicial the rates on cement from Ada, Okla., to destinations in Texas and to Artesea and Roswell, N. M., prior to December 12, 1927, and dismiss the complaints.

Marquette Organization Celebrates at Cape Girardeau

First Winners of Association Trophy in Missouri

THE CAPE GIRARDEAU plant of the Marquette Cement Manufacturing Co., located in the metropolis city of southeast Missouri, celebrated the dedication and unveiling of its Portland Cement Association safety trophy on Saturday, June 15.

Industrial leaders, educators, clergymen and citizens of Cape Girardeau and surrounding cities joined with workmen of the plant and officials of the company in an extraordinary occasion in the interests of plant and community safety and in testimony to the spirit of good will which the perfect safety record of over a year and a half reflects.

The program was as follows:

Assembly Called to Order—Richard Moyle, Sr., general superintendent, Marquette Cement Manufacturing Co., LaSalle, Illinois.

"Marquette March"—Cape Girardeau Municipal Band.

Invocation—Reverend H. C. Hoy, pastor, Centenary Methodist Episcopal Church.

"Greetings from LaSalle Plant,"—John J. Kelly, director of Industrial Relations, Marquette Cement Mfg. Co., LaSalle, Ill.

"Message from the Chicago Office"—L. W. Saxby, purchasing agent, Chicago.

Address Formally Presenting Trophy—A. J. R. Curtis, assistant to general manager, Portland Cement Association, Chicago.

Unveiling of Safety Trophy—Miss Verna Mae Cole.

"Stars and Stripes Forever"—Cape Girardeau Muncipal Band.

Acceptance of the Trophy—J. G. Thompson, chief chemist, Cape Girardeau plant.

Address of Appreciation on Behalf of Company Officials—W. A. Wecker, secretary-treasurer, Marquette Cement Mfg. Co., Chicago, Ill.

Address, "The Golden Rule of Safety"—Senator Russell L. Dearmont of Cape Girardeau.

Presentation of Safety Prizes — M. P. "Safety" Greer, safety engineer, Cape Girardeau plant.

Band Concert and Refreshments.

R. B. Dickinson, vice-president and general manager, Marquette Cement Manufacturing Co.

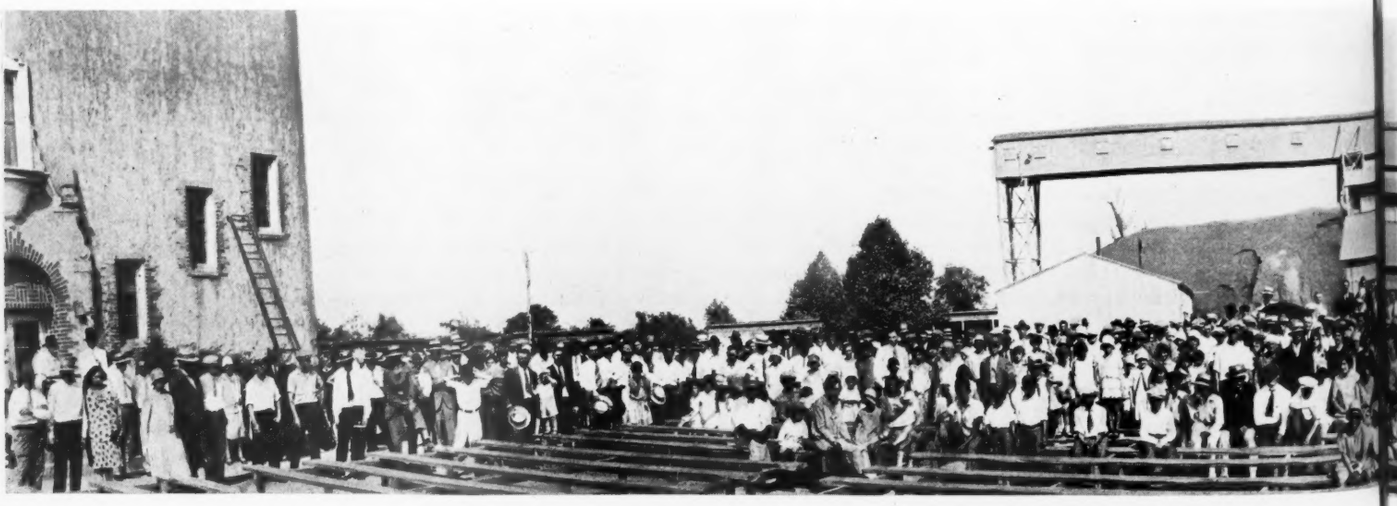
Warm Day—Big Crowd

Notwithstanding the extremely warm day, a good-natured and much interested crowd packed the plaza in front of the plant office building well in advance of one-thirty p. m., the hour set for the program to begin. Interest and enthusiasm remained at high pitch throughout the meeting, which lasted nearly two hours. In spite of brilliant sunshine which burned faces and necks and wilted collars, the crowd remained attentive and greeted each new program feature with a round of applause. It was the day for which many of the men of the plant had been working for five years and they and their families were there to make the most of it.

Address of Welcome

H. O. Cole, plant manager, welcomed the gathering and said:

"I am particularly happy to greet you on this occasion. The occasion, which we celebrate this afternoon, is the result of the united efforts of the officers and the employes of this company. The trophy awarded us is not the result of accidents, but it is the culmination of a studious effort on the part of the officers and employes of this company to observe every rule and precaution for the safety and welfare of our employes. A strict adherence to these rules and precautions has enabled us to accomplish that which money could not acquire. During the year 1928 our organization was not impaired by death or injuries to workmen due to accident in our plant. These men



Employes, families and friends of the Marquette Cement Manufacturing Co.

have gone to their place of employment every day, met its duties and responsibilities, and gone home to their families in good physical condition. Death or injury to an employe is not only a calamity and loss to the family and friends, but it is frequently a serious loss to the employer. It is difficult to replace any skilled, efficient and loyal employe. Humanity and efficiency of service require the adoption and adherence of certain rules of safety.

"The Marquette Cement Manufacturing Co. had in its employ in 1928 an average of about 350 men. The fact that we went

H. O. Cole, plant manager

through the year 1928 without a lost-time accident is very significant. It could not have been accomplished without the cooperation of the officers and employes. The chief aim of this company has been production, not only in quantity, but quality, and at a minimum cost. In our effort to achieve this goal, the working conditions of the employe have not been overlooked. Modern machinery has been installed, and modern methods adopted with a view of reducing injuries to the workmen. The employes of this company appreciate everything that has been done for them. They have been loyal and faithful to the company; they have worked hand in hand with the company in an effort to accomplish that which the company set out to do. The goal of the company has been their goal, and the success of the company has been due to the faithful and unselfish cooperation of all the employes of the company. The achievement which we celebrate today cannot be attributed to any department of this company. Every department has had the safety of the employes in mind and has striven to accomplish the result which we now celebrate. Every officer and employe of the company is entitled to credit for his share in this accomplishment. It could not have been achieved without the unselfish and energetic cooperation of every man in this company.

H. O. Cole speaking before the unveiling of the trophy

"We have every reason to be proud of the record; the employes are proud; the the number of men employed, and the character of their employment, it is unusual to go through a year without a lost-time accident. This company is proud of the record; the employes are proud; the city of Cape Girardeau and community are proud of it, and it is right and fitting that such an occasion be not passed, unnoticed. We have here today the officers and employes of the company, the families and friends of the company who rejoice with us in this achievement. We appreciate your loyalty and fidelity. We are glad to have you participate with us in this celebration and we welcome each and everyone of you here today."

Safety Movement Is Popular

Near the close of the program, when Chairman Moyle called M. P. Greer to the

celebrating the perfect safety record of 1928 at the Cape Girardeau, Mo., plant

platform to award the safety prizes the latter's popularity was attested by rousing cheers for "Safety" as Mr. Greer has been known. Mr. Greer received many compliments for his excellent generalship in organizing and pushing to successful conclusion, the plant's campaign for the Association trophy. One hundred members of the plant safety committee and safety police

W. A. Wecker, secretary-treasurer, Marquette Cement Manufacturing Co.

were given prizes in appreciation of conspicuous efforts on behalf of the safety work at the plant. The prizes consisted of first class modern lunch kits and leather bill folds. All the prizes had the names of the recipients permanently placed upon them.

In addition to the many verbal messages of congratulation from prominent persons present, numerous telegrams were received. President Theodore Dickinson and Vice-President Robert B. Dickinson, of the Marquette company, both of whom were unable to attend, conveyed their greetings in wire messages, which read as follows:

SAFETY TO HUMAN LIFE SHOULD BE THE UNDERLYING PRINCIPLE OF ALL INDUSTRIAL PLANTS. BUILDINGS OR MACHINERY THAT ARE DESTROYED CAN BE READILY REPLACED, BUT INJURY TO A HUMAN LIFE IS IRREPARABLE. PLEASE PRESENT MY CONGRATULATIONS ON THIS AUSPICIOUS OCCASION AND MY COMPLIMENTS TO THE GOOD PEOPLE ASSEMBLED WITH YOU.
THEODORE DICKINSON.

REGRET VERY MUCH MY INABILITY TO BE PRESENT ON THIS MOST AUSPICIOUS OCCASION. PLEASE PRESENT MY CONGRATULATIONS TO ALL PRESENT.
R. B. DICKINSON.

Telegrams were also received from Frank H. Smith, president of the Portland Cement Association; J. B. John, chairman of the Committee on Accident Prevention and Insurance of the Cement Association; H. G. Jacobsen, former manager of the Association's Bureau of Accident Prevention, and others.

Mr. Wecker's Message

W. A. Wecker, secretary-treasurer of the Marquette company, spoke as follows:

"I bring you the greetings and hearty congratulations of the officers and directors on this worthy occasion.

"This is an event which is entirely your own. You alone have made it possible. You alone have struggled and striven through more than an entire year in a most worthy effort to demonstrate that life and limb are emphatically not the incidental sacrifices to modern industrial activity. You have earned the right to rejoice on this occasion and it is most fitting that you should have here now a monument to that trying initial effort.

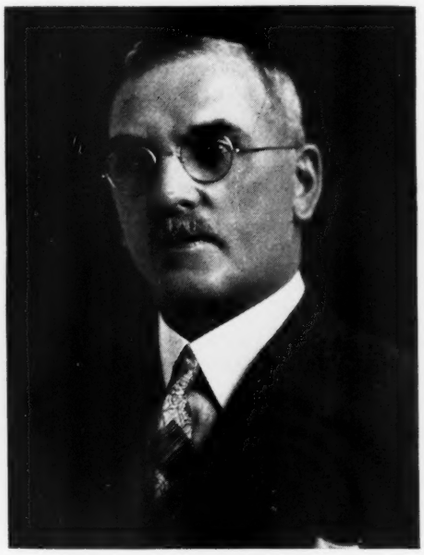
"But that monument will be more than a reward for a work well done. It will be an everyday symbol of the ideal of preservation of life and limb, a constant inspiration to keep the record unmarred and unblemished, and as time goes on, you will find it will have been of inestimable help in making it increasingly easier to keep that record intact.

"Back in your mind you have always had the conviction, whether you thought about it or not, that your daily activity could be made entirely free from the possibility of injury, by the application of thoughtfulness and a little common sense.

"Management, too, realized this fact but somehow a way could not readily be found to bring together this conviction of yours and the hope of management, and hand in hand put an end for all time to this depressing spectacle of continued human distress. And let me tell you here that management has had its own particular share of this distress. It has felt an acute responsibility for the happenings within its sphere and it has, I assure you, spent many an hour in serious consideration of ways and means of conveying to you its sincere desire to rid you and itself of this constantly recurring nightmare.

"And then the Portland Cement Associa-

M. P. Greer, safety engineer, Cape Girardeau plant



Richard Moyle, Sr., general superintendent, Marquette mills

tion took a hand and with the encouragement of its members, began a program of intensive activity. The principle underlying all this effort was the simple knowledge that you already had tucked away in your minds the idea of safety, and wanted or needed only the assurance that your associates whole-heartedly desired that you act upon it, put it to work and exercise that inborn quality of preservation.

"And you have done it—have done it alone—by yourselves as it only can be done—and in doing so you have eliminated the by-product of lack of thoughtfulness—which is carelessness, the direct—but not to my way of thinking—primary cause for all industrial accidents.

"And now that you have to your credit such a commendable beginning, you will not rest on the laurels you have earned. You will go on, impelled not by the expectation of material reward, but by forces infinitely greater and vastly more worthwhile.

"In reality you dedicate yourself, on this occasion, to a continuance of a desire for freedom from this avoidable and wholly unnecessary by-product of your work, and as time goes by, you will find that it will have become a part of your subconscious mind, expressing itself and by itself in your daily activity without recourse to your conscious thought. Safety is already becoming a habit with you."

In turning the trophy over to the mill

organization on behalf of the Portland Cement Association, A. J. R. Curtis said:

"This is both a happy and a fortunate occasion. The remarkable record of your cement mill here in Cape Girardeau in avoiding personal injury to its workmen for a period of over 500 days, is the wonderful circumstance which brings us together today.

"It is almost inconceivable that so large a group of men, constantly exposed to so great a variety of hazards, could continue uninterruptedly to avoid physical harm for so long a period. Only a few years ago this record was impossible and inconceivable. Last year you won the most distinguished honor it is possible for a mill organization to attain, by achieving what men have considered the impossible.

"Therefore, I am happy to convey the congratulations of our entire industry to W. A. Wecker, secretary-treasurer of the Marquette Cement Mfg. Co., to Messrs. Richard Moyle, Sr., general superintendent; H. O. Cole, plant manager; R. C. Matthews, superintendent; M. P. Greer, safety engineer, and to every employe and his family. You have earned the respect of your entire industry and community.

"Intelligent training, ability and eagerness to work with others toward a common objective and a brotherly regard for the welfare of fellow workers are characteristics of your organization which have put this big achievement across. Keep in mind always that the need for safe thinking is perpetual, and no season, month, week, day or minute is free from the possibility of accident unless every workman is on the alert.

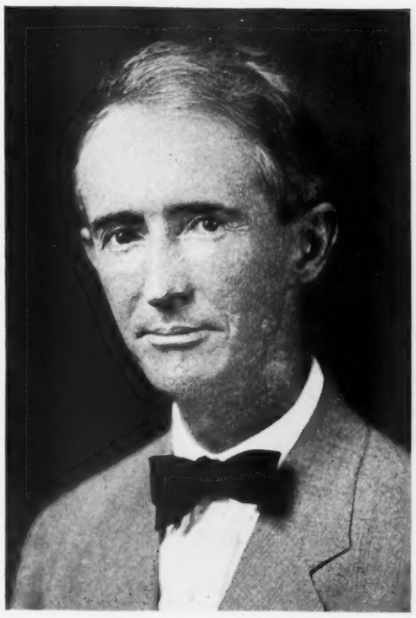
"Your representatives, Messrs. Ford and Mason, received the formal award of the trophy for you at New York on May 21. Acting by authority of the board of directors and on behalf of the members of the Portland Cement Association throughout America, it is now my pleasant duty to turn over to you the Portland Cement Association trophy for 1928.

"With the trophy go our best wishes for the continuance of your leadership in this magnificent movement for safety, and our hopes that your present record may continue indefinitely."

At the close of Mr. Curtis' remarks, Miss Cole pulled the string which released the covering and revealed the trophy to the crowd. J. G. Thompson, chief chemist, said in accepting the trophy on behalf of the mill organization:

Mr. Thompson's Acceptance Address

I want to thank Mr. Curtis for his kind and inspiring remarks and suggestions. We would like to have him carry back to the Portland Cement Association some idea of our enthusiasm in having received this award, our sincere appreciation of what this trophy means to us now, and what we know it is going to mean to us in the days to come. We want him to know that we hope to leave no stone unturned to continue indefinitely our no lost time accident record so that there may be no blemish on this symbol of our past success.



J. G. Thompson, chief chemist, Cape Girardeau plant

Enthusiasm Must Not Wane

Ladies and gentlemen, I assure you that is no light promise nor is it one of any small undertaking. For fulfillment it means that every individual working at this plant must exercise continual and unceasing vigilance and care. It means that we dare not let our individual or collective enthusiasm wane for even an instant and that as in the past we must have always in mind safe practice for ourselves and for the buddy who is working with us. It has come to our attention that although the portland cement industry has made greater strides than possibly any other great industry in reducing lost time accidents and has made almost unbelievable progress in eliminating accidents of a minor nature, the more serious accidents have not been proportionately reduced. It behooves us, therefore, to continually strive toward greater heights.

That does not mean that we are not inordinately proud of our record for the past 17 months. But, why shouldn't we be proud? Even to some of us who have watched this record grow from day to day and finally blossom into the fulfillment of our fondest hopes and desires it seems almost unbelievable that this most longed for trophy that we have so strenuously worked for and hoped to win is actually in our possession. On the other hand, remembering all the activities that were carried on to gain this end and the factors and elements that were instrumental in achieving this success, we could not but believe that some day success would be ours.

And now this great day for us has actually arrived and I hope we may be pardoned if we seem to be unduly elated, for in the enthusiasm of our own success we believe that this success should encourage others who are also engaged in this great work in other organizations and activities. So great indeed has become the need and importance of accident prevention in almost every walk of life that movements are afoot all over this land with just that end in view. No less a personage than the governor of this great state recently issued a proclamation imploring all who use the highways to join in an endeavor to reduce the deplorable number of automobile accidents that occur.

Years ago, before any organized activity toward accident prevention had been attempted, it was the practice in most cement plants to give the chemists the job of rendering such first aid as they could and injured men either came or were brought to the laboratory. We became acquainted with how these accidents happened and because of the suffering and anguish we so frequently witnessed we could not help but become eager converts to any movement that gave promise of preventing them. Back in the early days of the Portland Cement Association a department was created to study and offer suggestions for accident prevention.

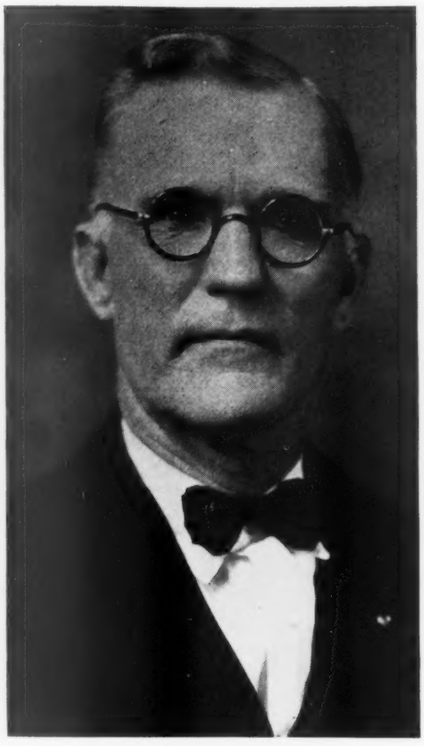
First Organized Efforts

At this plant which then belonged to the Cape Girardeau Portland Cement Co., our first organized effort along this line was in following the suggestions that guards should be placed on moving parts of machinery wherever possible. Our blacksmith in those days spent fully half his time in making and placing guards. He was ingenious, and moving parts and hazardous places throughout the plant were thoroughly taken care of. That was fine as far as it went. We still make use of guards wherever possible, but it was soon evident that guards alone were not all that was needed. The era of guards lasted for quite a while, but during that time the study of accidents and the compilation of data was being intensively carried on by our Association engineers and others and gradually was evolved the line of attack we are following today and which has in recent years been more and more successful. It is essentially what is so concisely stated in the three words inscribed on our trophy, "Safety Follows Wisdom."

Wisdom is one of the products of education. Education then was what we needed. If we may hope for success we must all be educated to believe that accidents are not necessary and for the

most part they are the result of someone's carelessness or lack of wisdom. The individuals of our organization were converted to that belief. This conversion was accomplished through rotating committees of the men themselves that in time would include every man in the organization. In 1923 the Marquette company took over this plant. Their LaSalle plant had been one of the first to make use of the educational idea in prevention work and for some time before the purchase of this plant they had been putting this into practice and with such marked success that although they employed many more men than at this plant they had fewer accidents at LaSalle. It was my privilege to organize and act as chairman of the first committee appointed here. So eager was our company for success along this line that they were not satisfied with only the part time that I could give this work, but decided that we should have someone who could devote all his time and energy to it, and so it was that our friend Mr. Greer here joined our organization with all his youthful energy and enthusiasm and eventually took over all the work and responsibility of this department. He was not here long before he was nicknamed 'Safety' and most appropriately so. One of his most pressing problems is to keep up the continual and unflagging interest of all individuals in our organization in this work. The management has generously supplied us with expense money for our awards and tokens and with prize money for our various local contests.

Among our first and earliest activities to create interest were contests among our various departments with prize money awards to those who succeeded in going a month without an accident. The first time our whole plant went through a whole month without a lost time accident we had a celebration. When we had completed a year without lost time accident we had another and larger celebration among ourselves. Many of you no doubt remember our parade through the streets of Cape Girardeau early this year. We have the services for an hour each day of one of the city's leading physicians. Our first aid room is modern and fully equipped to take care of almost any emergency. We have an active safety police force, the police chiefs being elected by popular vote. We, of course, make use of bulletins and warning signs. One of the considerations that was most influential in deciding our management to change to the eight hour shift was the beneficial effect they believed it would have in eliminating accidents.



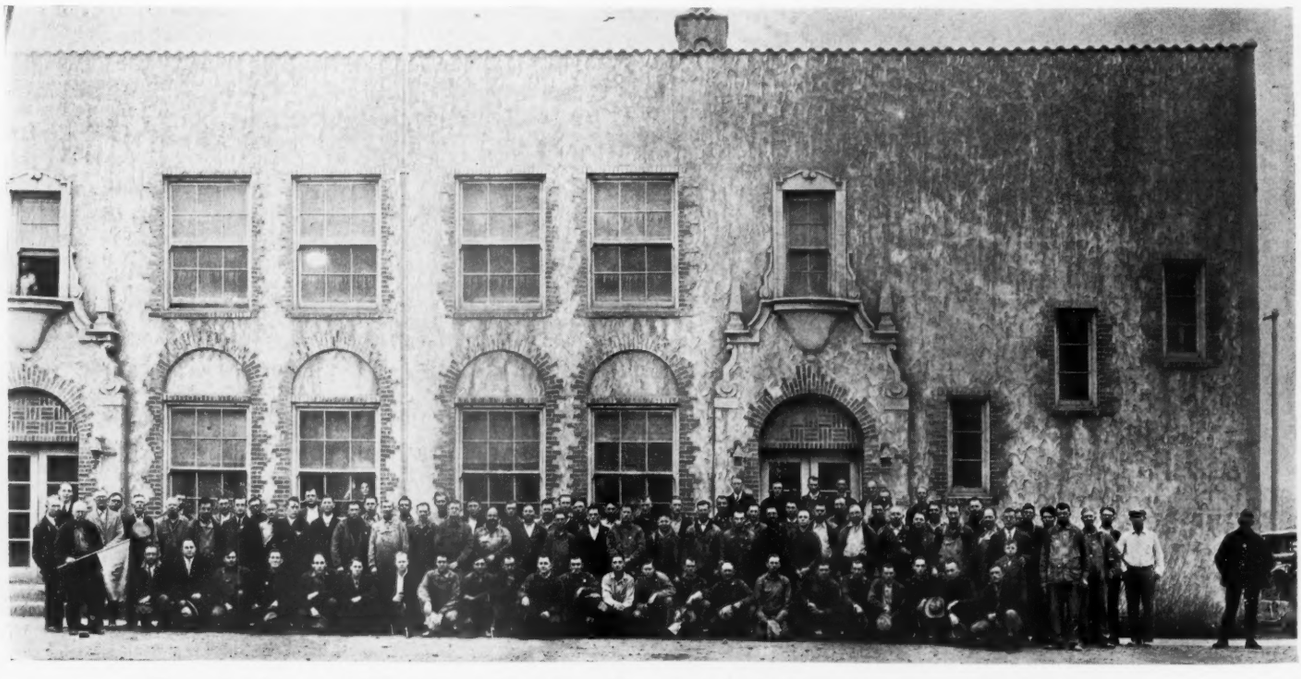
R. C. Matthews, superintendent, Cape Girardeau plant

We believe, however, that the greatest single factor that contributes to success is our weekly committee meeting wherein all matters pertaining to safe practices are brought up for discussion, wherein the accidents reported through the Association's regular bulletin are studied and discussed and wherein we, as individuals, become imbued with the worthiness of the aims and ideals of this movement; for after all, it is to the individual that we must look for success, for without his cooperation we could never succeed, and so I say to each and every one of the men at our plant should the final praise be given.

Golden Rule of Safety

Senator Dearmont spoke as follows:

I am indeed happy to appear here on this occasion and to join with the officials and employees of the Marquette Cement Manufacturing Company and the citizens of this section in celebrating the remarkable safety record made by the Cape Girardeau plant during the past year. We all join in tendering to you our sincere congratulations for the success which you have achieved in your safety campaign.



General safety committees, Cape Girardeau, Mo., plant of the Marquette Cement Manufacturing Co.

Cape Girardeau, Mo., plant, Marquette Cement Manufacturing Co., which worked almost one million man-hours in

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ost one million man-hours in 1928 without accident, a greater number than any of the other Portland Cement Asso

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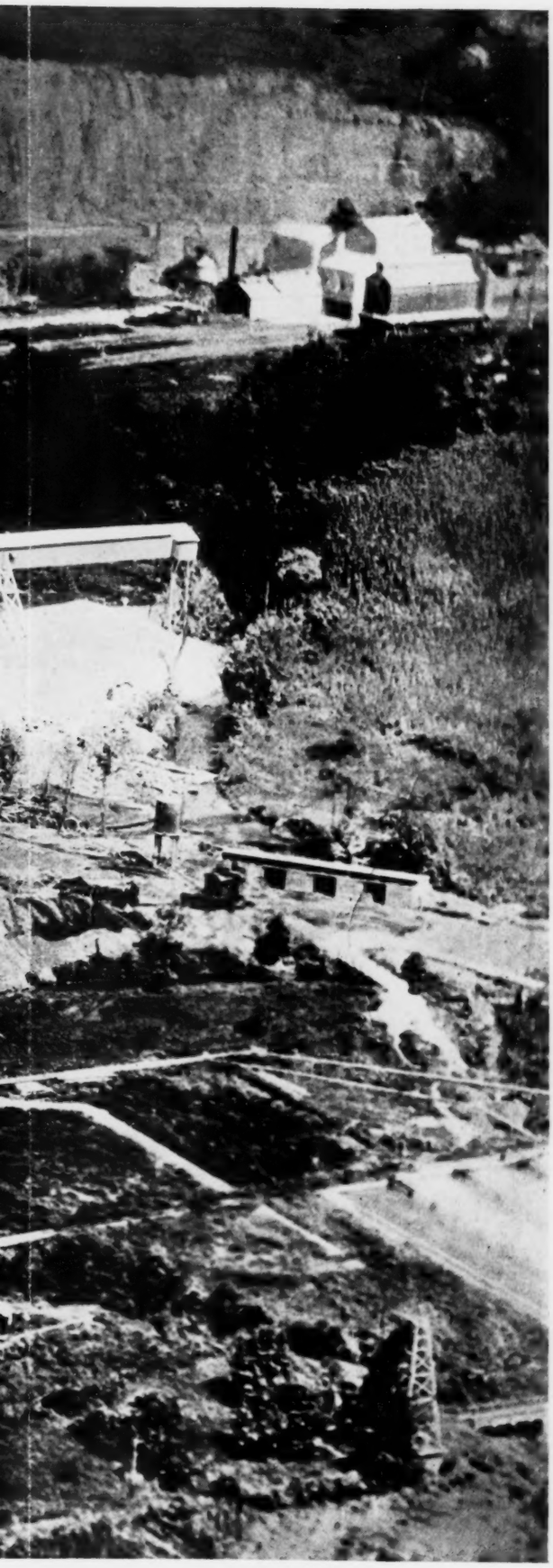


ment Association safety trophy winners

. . . . Speaking of our industries, times have changed. There was a time when we looked upon our manufacturing plants, our industries, as great steel monsters, with no heart, no soul, going their way producing their products, using therein not only inanimate objects and materials, but exacting, necessarily, a certain toll of maimed and torn bodies of its workers and oft times life itself.

Time was when there was no real understanding between employer and employe; when the employer seemed to have little thought, consideration or regard for the comfort, safety and well being of the employe; when the employe seemed to have little regard for the success of his employer and apparently little regard for his own personal safety or that of his fellow employe.

But those times, in the history of American industry, are fast disappearing, and we are here to celebrate a wonderful achievement of our own Marquette cement plant, which I think can be largely traced to the fine spirit of cooperation, apparent here, between the officials and employes of this company.

Certainly it is true that if the officials of this company were not real men, actuated by a higher motive than that of making dollars, if they were not wholeheartedly behind this safety program, it could not succeed. I congratulate them and assure them that they are setting a fine and noble example and are to be praised and commended for their part in this great program.

Nevertheless, it is true that no amount of encouragement and assistance from the officials of the company could make it succeed. The success must finally depend upon the fine spirit and activity of each and every employe of the company.

Therefore I congratulate you, the employe of the company, without regard to your rank or position, upon the truly remarkable record which you have made.

Not only have you protected the life, limb and well being of your individual selves but you have proven yourselves in spirit at least, followers of the teaching of the greatest Teacher of all.

. . . . You have proven yourselves men of superior intelligence, men possessed of a fine unselfish purpose in life—and I can not too sincerely commend and congratulate you.

For the benefit of the citizens and visitors here, who may not know the progress which was made, from the beginning of the safety campaign, by the Cape Girardeau plant, in 1924, to the year 1928, when a perfect record of no "lost time accidents" was made, I want to give that record.

In 1924 the plant suffered 66 "lost time accidents" with a loss of 1959 days' work by injured employes. In 1925 there were 14 "lost time accidents" and 236 days lost. In 1926, there were 8 accidents, with a loss of 167 days. In 1927, there were 6 accidents, with a loss of 144 days. In 1928, there were no "lost time accidents," a perfect record. During 1928 the employes worked 955,982 or almost one million manhours, which gives some idea of the importance of the task accomplished. I should also say that until this date, with about one-half of the year 1929 gone, the record is still clear. There have been no "lost time accidents" to mar the record in 1929.

We all join in wishing the officials and employes "Godspeed" in their effort to continue their noble work and express the great hope that the close of 1929 may show another perfect safety record.

France Stone Co. Entertains Employes

OVER 70 EMPLOYES and friends of the France Stone Co. celebrated the termination of the 1928 safety contests between the 20 different quarries operated by the France company. The Bloomville, Ill., quarry won the trophy on the basis of operating during the entire year without a single accident.

At the banquet served the quarry employes, C. G. Adams, district superintendent of the company, acted as toastmaster. The principal speeches of the evening were made by D. G. Slee, who is connected with the main office at Toledo, and D. G. Souder of Toledo, formerly at the head of the safety department, and Attorney Harry Frick of Tiffin.—*Bloomville* (Ohio) *Gazette.*

To Develop British Columbia Phosphate Rock

ACCORDING to all present indications, the Consolidated Mining and Smelting Co. is headed toward one of its typical successes when it finally undertakes to produce and distribute commercially its new fertilizer which it has been developing from the large deposits of phosphate which it controls in British Columbia. The company is controlled by the Canadian Pacific Railway. The new fertilizer product has been under test now for some time on the prairies and it is stated to have proved thoroughly satisfactory in all respects. In fact, agriculturists who have made special studies of the product maintain that in it they see one of the real solutions to many of the problems which have for years been confronting the agricultural elements in western Canada. It is figured that the prairie provinces can absorb several million tons a year of this fertilizer and that as time goes on the consumption should increase steadily.

Heretofore a large scale supply of fertilizers has not been available to western Canada, but it is now felt that the company will quickly reach a stage where it will be able to take care of all requirements. The fertilizer is expected, when it comes into general use, to encourage both earlier harvesting and increased yields. It will permit in many sections of much closer crop rotation than has previously been possible.

From a corporate point of view, the foregoing is very interesting to shareholders of the company because it indicates to them a new and very promising source of revenue for their organization. Gradually, the management is building up its source of income through diversification of activities and the greater utilization of its facilities, particularly in turning byproducts into income. All this is entirely apart from the extension of its mining and development interests and illustrates still more strikingly the long cherished idea that the organization has become less of a mining and more of an industrial enterprise, which tendency the years will very likely further strengthen.—*Wall Street News* (New York City).

Pennsylvania Quarry Workers Attend Safety Sessions

WORKERS of 15 quarries throughout Lancaster county, Pennsylvania, attended a safety conference held recently by the Pennsylvania State Department of Labor and Industry in connection with the statewide campaign on industrial safety.

Thomas J. Quigley of the state department, Harrisburg, pointed out the necessity of practicing safety in the quarry industry in view of the fact that the work is considered very dangerous. Five reels of motion pictures, illustrating the results of applying safety methods in work, were shown.

Representatives of the following quarries attended the meeting: J. E. Brenner Co., J. R. Miller, John B. Heiding and Sons, Brenner and Hiestand, Binkley and Over, East Petersburg; Winters Quarry, Manheim; Pharo Rohrer's Quarry, Lititz; A. G. Kurtz, Ephrata; Keller Quarry, Clay; Landis Quarry, Paradise; Showalter Quarry, Kinzer, and the Denlinger Quarry.—*Lancaster* (Penn.) *Examiner.*

Safety in Brick Making

THE NATIONAL SAFETY COUNCIL has published an illustrated booklet entitled "Safe Practices in Brick Making," which is a compilation of experience in accident prevention in this industry. Accidents peculiar to each department of the brick plant and ways in which they may be avoided are outlined in the booklet, copies of which may be obtained by addressing the National Safety Council, 108 East Ohio street, Chicago. Particular emphasis is laid on avoiding accidents in the clay pit, due to careless digging, improper handling of explosives, use of defective equipment, etc. Of interest to ROCK PRODUCTS readers will be the chapter on how hazards in sand-lime brick manufacture may be overcome.

Senate Finance Committee Holds Tariff Hearings on Rock Products

LEADING off with the testimony of importers opposed to a duty on cement, which they assert is not needed by prosperous, well-organized domestic producers, the subcommittee of the Senate finance committee conducting hearings on the earth, earthenware and glassware schedules of the tariff bill (H. R. 2667), opened its second day of hearings, June 20.

Cement Duties Debated

Arguing that domestic producers seeking a duty on cement are the smaller and overcapitalized companies, and that the large, well-organized producers are prosperous, E. R. Hollander of the Ferro Crete Import Co., New York City, asked that roman, portland and other hydraulic cement be kept on the free list. The House bill, in paragraph 205(b) makes this cement dutiable at 8 cents a 100 lb.

The rate on cement proposed by the House of Representatives was supported by Frederick W. Kelley of New York City, who said he represented the domestic cement industry. He said also that the proposed duty would go only part way toward protecting the seaboard manufacturer. Because of high transportation costs, the coast factories bear the brunt of foreign competition, he said. He denied that there was an understanding to fix prices.

Higher Duty on Pumice Asked

F. L. Goetz of James H. Rhodes and Co., Long Island City, N. Y., speaking for the three pumice manufacturers in the United States, sought an increase on wholly or partly manufactured pumice stone from $11 to $20 a ton. In the House bill, the $11 rate of 1922 is retained. A higher rate is needed to enable domestic finishers to compete with Italian labor, he said.

Differentiation between acid, ceramic and metallurgical fluorspar which are grouped together in the House bill and increased from $5.60 a ton to $8.40 a ton was urged by F. F. Colcord of the United States Smelting and Refining Co., New York City. Acid and ceramic fluorspar he asked to be kept under the old rate of $5.60 a ton.

Rates on Mica Considered

Continuing to the mica schedules, H. M. Urban of Spruce Pine, N. C., representing the Domestic Mica Producers Association, asked a duty of 15 cents a pound and 25% ad valorem on unmanufactured mica.

In the House bill, 4 cents a pound is placed on manufactured mica valued below 15 cents a pound and 2 cents a pound and 25% ad valorem is placed on unmanufactured mica worth over 15 cents a pound.

The witness also asked that mica splittings be reduced from 30% to 25% ad valorem and that mica plates be taken out of the classing with splittings and placed with all manufacturers of mica or of which mica is the component of chief value. This latter class of manufactures, on which the bill as it comes from the House levies 40% ad valorem, Mr. Urban would have increased to 40 cents a pound and 50% ad valorem. All these items occur in paragraph 208.

"Whatever tariff is written, the duty on manufactured mica must be at least double that on unmanufactured mica if the industry is to be kept in the United States," he declared.

F. W. Horton of the Bureau of Mines testified that in his opinion the domestic mica supply was more than plentiful for the demand and that the quality of the domestic product equaled foreign mica.

Foreign Quality Claimed Best

Allan Gerdau of New York City, a distributor of domestic and foreign mica, insisted that domestic and foreign mica do not compete because the foreign is of better quality and sells at half again the cost. He assigned as the reason for a request for higher duty on high-grade mica the desire of domestic producers to get rid of their lower grade products.

Crude mica, he argued, could well come in free for the benefit of domestic manufacturers of mica products who have been forced out in some lines. Further, said Mr. Gerdau, electrical manufacturers are finding and using substitutes for mica continually.

Representing the Storrs Mica Co. and numerous consumers of mica, James F. Gerneau declared that electrical users of mica are unable to employ the domestic product. In the last seven months, he declared, there has been a scarcity of mica and the price has increased rapidly.

S. Herbert Brown of the Asheville Mica Co., Asheville, N. C., a manufacturer, told the committee that 15 years ago he had used 98% of the domestic product and 2% of the foreign. Last year, said the witness, he purchased 55% of his mica abroad and so far in 1929 has bought 70% of his needs abroad.

This Mr. Brown attributed to the cheaper price abroad. He joined in requesting the increases suggested by Mr. Urban.

Rate on Powdered Talc

Michael Doyle of the International Pulp Co., New York City, testified in behalf of a change made by the House in the present law on ground, washed or powdered talc in paragraph 209. Here the duty was changed from 25% ad valorem to ⅜ of 1 cent a pound. Mr. Doyle stated that while glad to accepted this increase, his company would prefer ½ of 1 cent a pound.

Levi Cooke, speaking for Charles A. Wagner of Philadelphia and Samuel H. Clark of Whittaker, Clark and Daniels, Inc., New York City, declared that the talc represented by Mr. Doyle was of a peculiar characteristic, giving it a geographical monopoly with no competition. He said that the House specific duty was comparable to a 40 to 70% ad valorem duty.

Ask Protection for Graphite

Representative Patterson (Dem.) of Alexander City, Ala., speaking for the Alabama graphite industry, said that American graphite has been found by the Bureau of Mines to "measure up" to any in the world.

The congressman asked 5 cents a pound on crystalline lump, chip, dust and flake graphite. The House reduced, in paragraph 213, the duty on crystalline flake from 1½ to 1¼ cents a pound. The other crystalline forms were increased by the House from 20 to 25% ad valorem.

Dr. Walter B. Jones of Atlanta, industrial geologist of the Atlanta, Birmingham and Coast railroad, told the committee that graphite deposits, chiefly flake, in his section, were ample to supply all the demand. He joined in requesting the same protection asked by Representative Patterson.—*U. S. Daily.*

Canada Cement Preparing for Bulk Cement Shipments

THE CANADA CEMENT CO. plans to erect a large wharf in St. John harbor on the waterfront property recently owned by the Portland Rolling Mills. The property, comprising about 46,800 sq. ft., was recently purchased to erect a large storage warehouse for the bulk storage of cement.

The company proposes to construct two piers of crib-work, about 80 ft. apart. A short conveyor will carry the cement to the central pier in the rear, where it is to be transferred to a larger conveyor which will take the cement up an incline to large silos, from which it will be conveyed to bagging rooms and sacked for truck or freight car shipment.

The company can by this method bring the cement to St. John in bulk shiploads and could also export cement to other countries by steamer.

Recent Contract Prices

DUBUQUE, Iowa—Contract let to the Dubuque Stone Products Co. for furnishing crushed rock for the Farley-Bankston road. Total amount, $89,122.40. Cost per ton, $1.81.

Hopewell, Va.—Contract for 17,000 cu. yd. sand and gravel, split between Norfolk Sand and Gravel Co. and Dixie Sand and Gravel Co. Contract price, 75c per cu. yd. (exclusive of 400 cu. yd. of building sand at 85c per cu. yd.).

Arkansas' New Cement Mill Almost Ready to Commence

FORMAL inspection of the new $2,500,000 cement mill of the Arkansas Portland Cement Co. at Okay, Ark., was made recently by a group of company officials and invited guests. The Ideal Cement Co., which is the parent company of the Arkansas company, chartered a special train for the party which included members of the State Highway Commission and friends from Little Rock to inspect the new plant. The train left the Missouri Pacific station at 8 a. m. on June 20, arriving at Okay at 1:20 p. m.

Construction on the plant was started about 18 months ago, following an investigation of limestone and clay deposits near Nashville, Ark. About 800 acres of propery were acquired and a spur built about six miles from Okay Junction.

A town has been built for the 250 to 300 workers who will be employed regularly by the company as soon as it is in operation. About 40 small but comfortable and convenient homes are being erected to house the families of the employes, while a large club house has been built for use as a community center and for the accommodation of men.

Capacity operation of about 4600 bbl. per day is expected to be reached about August 15. Two large kilns, 300 ft. long by 11 ft. 6 in. in diameter, have been installed and arrangements made for a third kiln of similar size, to be placed when needed. Natural gas, piped from Emmett, 25 miles away, will be piped through a 10-in. main. The Arkansas Power and Supply Co. has built transmission lines from Waldo to the town of Okay. Finished cement will be shipped over the Missouri Pacific railroad lines, which connect with the company's lines at Nashville.

The following officials of the Arkansas Portland Cement Co. made the trip: C. Boettcher of Denver, Col., president of that company and of the Ideal Portland Cement Co.; C. D. Nichols of Oklahoma City, vice-president of the Arkansas company and of the Oklahoma Portland Cement Co.; D. M. Pinkston, sales manager at Little Rock; M. O. Matthews, manager of operations, and Jack Canby, special representative of the company.

The Arkansas highway and state officials present included Lieutenant Governor Lee Cazort; Justin Matthews, state highway commissioner; Dwight Blackwood, chairman of the State Highway Commission; Sam Wilson and Lan Williams, members of the commission, Donald MacCrea, consulting engineer of the highway department; W. W. Mitchell, division engineer of the department, and V. A. Kleiber, auditor of the commission.

Snow Wilson, president of the Big Rock Stone and Material Co. and a stockholder in the Arkansas Portland Cement Co., and J. C. Eakin, recently appointed sales manager of the Big Rock Co., also were in the party.

Missouri Pacific railroad officials who visited the plant were: John Cannon of St. Louis, vice-president and general manager of the railroad; W. E. Brooks of Little Rock, superintendent of the southern district; W. E. Lamb of Little Rock, superintendent of the Arkansas division; E. C. Wills of St. Louis, assistant general manager; C. K. Bothwell of Little Rock, general passenger agent; H. R. Wilson of Little Rock, general freight agent, and J. H. Einfeldt, superintendent of wage schedules.

Jim Skillern, general superintendent of the G. N. & A. R. R., and C. E. Ferguson, editor of the *Nashville News*, joined the party at Nashville.—*Little Rock* (Ark.) *Democrat.*

R. E. McLean to Head Big Harpeth Quarries

RALPH E. McLEAN, for 27 years head of the East St. Louis Stone Co., has leased the properties and plant near East St. Louis, Ill., and will remove his family to Nashville, Tenn., where he will become operating head of the Big Harpeth Quarries, Inc. The East St. Louis Stone Co. has been leased to a group of eastern capitalists who are now in charge of operation.

Morris McLean, his son, will be connected in a managerial capacity with the new Tennessee project and will depart at once to take up his duties. The plant is located in Nashville and the quarries are at Newson on the N. C. & St. L. railroad.

The stockholders in the corporation are Ralph E. and Morris McLean, J. G. Stephenson, attorney, and G. Keith, all of Nashville.—*East St. Louis* (Ill.) *Journal.*

Sand Company Would Dredge New Channel

O'BRIEN BROS. Sand and Gravel Corp. has applied to the U. S. Engineers for a permit to dredge in the mouth of Port Jefferson harbor. The company proposes to dig an entrance 200 ft. wide on the bottom and 320 ft. wide at the top and from 25 to 30 ft. deep.

The application has been brought to the attention of the Port Jefferson, N. Y., Chamber of Commerce and the merchants division, as well as the local shipyard and others directly interested in the harbor, with the result that the local organizations favor the permit with the reservation that the work be done under the supervision of a government inspector to be present at all times while work is in progress to insure a smooth and continuous channel bottom not less than 25 ft. deep nor more than 30 ft. deep and also to insure that the work be done with the least possible interference to navigation. —*Port Jefferson* (N. Y.) *Echo.*

Columbus Gravel Co. Enters Texas Merger

A CONSOLIDATION of the Columbus Gravel Co., Columbus, Texas, with the Texas Construction Materials Co. is reported as under way. The Texas Construction Materials Co. recently took in Gemmer and Tanner, operating plants at Columbus and Houston, Texas, increasing their capital stock to $600,000. The new merger requires another increase in capital, raising it to $800,000.

The Columbus Gravel Co. has been in business for some five or six years, during which time the concern has shown a continuous and steady growth.

The consolidation will open new fields for the marketing of this company's products through a better organized sales department and will, it is believed, make it necessary to enlarge the plant.—*Columbus* (Texas) *Citizen.*

Open New Soapstone Quarries

THE American Soapstone Finish Co., Inc., of Chester Depot, Vt., is opening a new quarry located about four miles from the grinding mill. A wide vein of good looking stone has been found. The company is also opening a quarry on the Charles Hodge farm.

This quarry has improved within the past few days and the firm is trucking to its mill a high grade of soapstone. The quarry is located about 2½ miles from the mill and near the main highway.

The company feels sure it has a good grade of stone in both quarries sufficient for many years of grinding, and as both quarries are on steep hillsides and the veins run the right way of the hills, it should not have much trouble from water.

These outcrops have been known for many years, but previous to this time no one had the courage to open them to any extent.

The original American Soapstone Finish Co. was a member of the Mechanics Exchange of Providence, R. I., back in 1884 and has been doing business in Chester for about 35 years, and for the past 18 years or more has been operating continuously.—*Chester* (Vt.) *Herald.*

Steger Company Planning Sand-Lime Brick Plant in Texas

ACCORDING to the *Ranger* (Texas) *Times*, J. W. Farrier of Fort Worth has been investigating the possibilities of Ranger, Texas, as a location for a sand-lime brick plant for the Steger Sand-Lime Brick Co. The contemplated plant would have a daily capacity of about 20,000 brick. It would be built on the unit system to allow for easy expansion.

The Steger company is said to operate nine sand-lime brick plants in Canada.

J. E. Carroll Sand Co. Merged with Buffalo Slag

MERGER of the Buffalo Slag Co. with the J. E. Carroll Sand Co. was announced recently by L. A. Beeghley, president of the former concern. The capital of the new company will be $1,100,000. The company will be the largest producer of slag, sand and kindred products in New York state.

Mr. Beeghley will head the merged companies. James E. Carroll, president of the Carroll company, will become a director of the Buffalo company. Weston M. Carroll and Miss Anna English, long identified with the management of the Carroll company, will continue with the new company.

Mr. Beeghley said:

"The merger rounds out our line of materials for concrete construction of all kinds and gives us a combined capacity in concrete aggregate of more than 2,000,000 tons annually."

The Buffalo Slag Co. now has affiliated plants in Buffalo, Harriet, N. Y., Emporium, Erie and Du Bois, Penn., and at Attica and Franklinville, the latter two plants being the ones acquired from the Carroll company. —*Buffalo* (N. Y.) *Times.*

Atlas Portland Starts Production at Waco, Tex.

A RECORD in cement plant construction is believed to have been made when the new Waco, Texas, plant was reported in operation early in June and ready to start shipments on June 24, or only nine months after ground was broken for the project. In connection with the announcement that the new plant was in full operation, John R. Morron, president of the Atlas company, made the following statements:

"We will begin shipping on Monday, June 24, and considering that we began construction operations only in October last, it is very gratifying to me that we have been able to fulfill in such a short time the promise we made last September to the effect that we would have an Atlas plant operating in Waco at the earliest possible date.

"Our objective to make this plant the most modern possible of construction has been fully realized and we have found that the properties in the raw materials of Waco are particularly well suited to produce the high standard of quality we demand in the Atlas products, which for more than 38 years has exceeded every specified quality requirement.

"The marketing policies governing the distribution of the product of this plant will be the same sound constructive policies that have been consistent with our company.

"It might be well to point out that the Atlas company also operates other plants in the west at Hannibal, Mo., and Independence, Kan., and in the south at Leeds, Ala. These and the new Waco plant are so located that they can supplement each other, and this contributes to efficiently handling any emergency demand."

The new plant will have a capacity of 1,000,000 bbl. per year. Operations will be under the direction of A. G. Croll, vice-president of the Texas Atlas Portland Cement Co. A sales office will be maintained in Waco at 1203 Amicable building, with C. S. McArdle, assistant to the president, in charge. C. H. Boice, sales manager; M. H. Hull, assistant sales manager, and E. C. Dipple, office manager, will be chief members of the force there. At the present time a sales organization is maintained throughout Texas working from the Waco office.—*Waco* (Texas) *Times-Herald.*

Southwestern Portland Improves Power Plant at El Paso Mill

THE RECENT installation of a 3500 kw. Westinghouse turbine, complete with a 7000 sq. ft. surface condenser and the necessary auxiliary equipment at the El Paso, Texas, plant of the Southwestern Portland Cement Co., has provided additional operation economies, according to W. C. Reith, chief engineer for the company. The unit was installed to secure greater steam economy and has given every satisfaction. Before installation, it required 21.5 lb. of steam to generate 1 kw. hour, but this has been reduced to 11.8 lb. of steam per kw. hour. All steam is supplied from the waste heat boiler plant operated in conjunction with the cement burning process.

Columbia River Royalties Issue Settled

REPRESENTATIVES of the land departments of Oregon and Washington at a recent conference held in Salem, Ore., entered into an agreement relative to the removal of sand and gravel from the Columbia river. The agreement was authorized under recent legislation of the two states.

The agreement, which is operative for 12 months, provides that each state shall receive 50% of the royalties received from sand and gravel taken from the river. Any expenses incurred will be borne equally by the two states. It was agreed that either state may withdraw from the agreement by giving 90 days' notice.

In settlement of the claim of the states for sand taken from the Columbia river prior to 1927, for which the operating companies offered $1000, the states have demanded $10,000. This money, if paid by the operators, will be divided equally between the two states.

The sand and gravel operators have protested this claim on the grounds that the Columbia river was considered a "no man's land" and that no value was attached to the land.—*Portland* (Ore.) *Oregonian.*

Pennsylvania Stone Producers Association Holds Meeting

THE John T. Dyer Quarry Co. was host to members and guests of the Pennsylvania Stone Producers Association on the occasion of one of the recent association meetings. Operators, superintendents and other personnel of quarry plants from all parts of Pennsylvania came to attend the meeting. All visitors were met and taken to the Dyer company office, where after introductions and registration the guests were taken on a tour of plant and property.

After a visit to the quarry and plant, the gathering was served with dinner at the big boarding house building. Following the meal a motion picture was shown of the big blast made at the quarry on May 30, 1927, when 85 tons of dynamite dislodged more than 1,000,000 tons of stone.

The business meeting was then held, at which methods of stone producing were discussed and other matters considered, addresses being made by officers of the association and heads of some of the large plants of the country.

A trip over the company's railroad in a fitted up car, drawn by one of the plant locomotives to Monocacy station, 1½ miles distant, for a visit to the big storage yard, was one of the features. The Monocacy quarry is the largest of three operated by the Dyer company in this section, one other being located at Trap Rock station, 2½ miles south of Birdsboro, and the other near Robeson station, 3 miles west of Birdsboro.

Preparations are in process for another record blast. Tunnels 5 ft. square are being driven into the solid rock from the face for a distance of 45 ft., and from this main stem drifts to the number of six, three in each direction, will be driven. About 45 ft. back from the face perpendicular holes will be drilled to a depth of 100 ft. Tunnels and holes will then be solidly filled with dynamite, tamped tight with fine stone and soaked with water, and then exploded.

The following were present: H. B. Hardesty, William Andrews, Elwood Boger, John R. Collins, Jr., Edward Neely, Joseph Brill, Carl Yaeger, Harold Smith, David Chernitz, M. Jacobs, F. W. Cramer, O. M. Graves, J. E. Baker, W. Baker, F. O. Earnshaw, H. E. Milliard, W. K. Young, E. J. Arters, J. A. Hipple, H. B. Allen, G. Brobach, F. T. Gucker, E. Souders, W. Soutar, E. T. Wolf, W. A. Kelly, A. H. Gumpert, J. Conway, W. B. Pritchett, E. H. Henderson, G. E. Wilson, W. R. Hazzard, A. L. Sheffer, W. Davis, W. T. Comer, C. W. Kinsella, O. J. Brunell, R. E. Graul, J. Jackson, J. E. Lazarlere, T. Reinhold, J. P. Tripper, P. F. Lewis, H. Rowan, H. T. Goldbeck, J. P. Peacock, C. V. Weaver, J. Rice, F. Jones, J. R. Cliffe, A. C. Hewitt, H. Muth, W. R. Fehr, J. O'Rourke, G. R. Shenberger, G. A. Heebe, P. Jones, Miss Victoria Yaeger.—*Reading* (Penn.) *Eagle.*

Cement Products

Making "Certified" Concrete in Omaha

Ready-Mixed Concrete Co. Maintains Testing Laboratory to Prove Quality of Concrete Made With "Sand-Gravel" Aggregate

THERE ARE two all embracing questions asked by nearly everyone who is interested in ready mixed concrete, especially those who contemplate entering that field. The first is, "Can I make any money at it?" and the second or correlative question is—"What do they get for their products in other localities?" The second question hinges on the ability to instill confidence in the user, especially the larger contractor, to the extent that the contractor will feel that if he orders a specific mixture with a definite cement, sand gravel or crushed stone ratio he will get that mixture.

Where the prices for ready mixed concrete are not, so to speak, on a competitive basis they will range from $7.00 to $18.00 per cu. yd., depending on the mix, the quantity and the distance hauled. The answer to the first question can be reflected from the quotations published as part of the advertising literature of the Ready Mixed Concrete Co. of Omaha, which is herewith reproduced.

Sand in the Omaha territory sells for about 30 cents per ton with sand-gravel (gravel) at 60 cents, f. o. b. the point of production plus a freight charge of 60 cents per ton delivered to points on the belt line railroad.

The Ready Mixed Concrete Co. of Omaha started operations late in 1928 at 15th and Manderson street. Shortly after it became apparent that there were two serious defects in the scheme of operation. First, the 1-cu. yd. capacity plant was not large enough and the second and more serious, was that the plant was not centrally located. Accordingly the company disposed of the Manderson street plant and on April 18 of this year placed in operation its new 2-cu. yd. plant at 42nd and Izard St. This location is as near to the center of the metropolitan area of Omaha as possible and also is fortunate in that it is served by the Belt Line railroad, a branch of the Missouri Pacific railroad.

The company soon realized that its pioneering efforts should be directed towards educating the contractors in the use of ready-mixed concrete. The savings to be effected by the use of this material were stressed. Further, by means of scientific tests the company demonstrated that its product was superior to that which the contractors were accustomed to mixing themselves. This was accomplished by the establishment of a field laboratory at their new plant, in which regular and systematic samples of the sand used and the concrete mixes are thoroughly tested. Concrete cylinders are made in the usual way for the compression tests and broken after 7 and 28 days hardening.

A remarkable feature of these tests is the high compression tests secured from a sand-gravel mixture in which the amount of "large" gravel is practically nil. By large gravel is meant material that will not pass a ½-in. opening as there is no coarse gravel in that vicinity. The material used is known as sand-gravel and is not a great deal different from the coarse concrete sands produced in the Indiana and Ohio territories. The so-called sand-gravel has the following screen analysis:

Retained on a 40-mesh sieve 90-92%

Retained on a 10-mesh sieve 48-55%

Pit run material which is also added to the mix shows even a larger percentage of

A specimen of direct-mail literature used in the company's educational campaign for the use of ready-mixed concrete

READY MIXED CONCRETE PRICES

EFFECTIVE MARCH 1, 1929.

FOR ALL BUILDING AND COMMERCIAL CONSTRUCTION BUSINESS

Delivered Anywhere Within the City Limits of Omaha

RED-D-MIX No.	28 Day Strength Per sq. in.	1 to 5 Cu. Yds.	5 to 25 Cu. Yds.	25 to 300 Cu. Yds.	RECOMMENDED FOR
1	3500#	$8.50	$8.00	$7.75	Concrete Roads, Floors, Watertight work.
2	3000#	8.25	7.75	7.50	Columns, Walls, General Re-inforced Work.
3	2500#	8.00	7.50	7.25	Sidewalks, Drives, Culverts, Retaining Walls.
4	2000#	7.75	7.25	7.00	Mass Construction, Footings, Paving Bases.

For high early strength concrete using "Quikard" or other super-cement, add $3.00 per cubic yard.

READY MIXED CONCRETE CO.

42nd and IZARD STREETS **GLendale 1866**

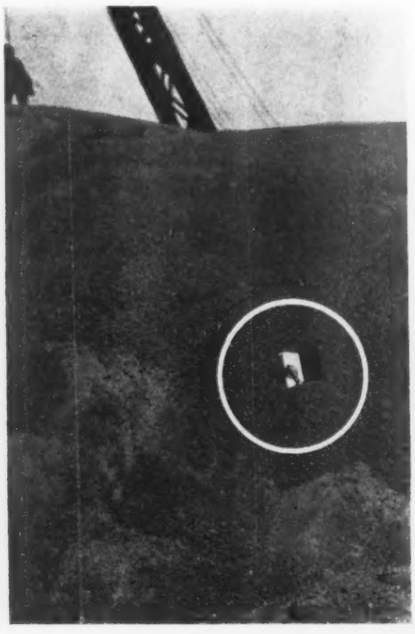
Price quotations for ready-mixed concrete are sent out regularly to contractors and others users in Omaha

fines and has the following approximate screen analysis:

Retained on 40-mesh sieve.....75-90%
Retained on 10-mesh sieve.....30-45%

Douglas County specifications call for pit run to be as follows:

Retained on 40-mesh sieve.....70-75%
Retained on 10-mesh sieve.....20-30%



Part of the "sand-gravel" stock pile. The size of this material can be realized by comparison with the objects within the circle

For sand-gravel the specifications are:

Retained on 40-mesh sieve.....85-90%
Retained on 10-mesh sieve.....45-55%

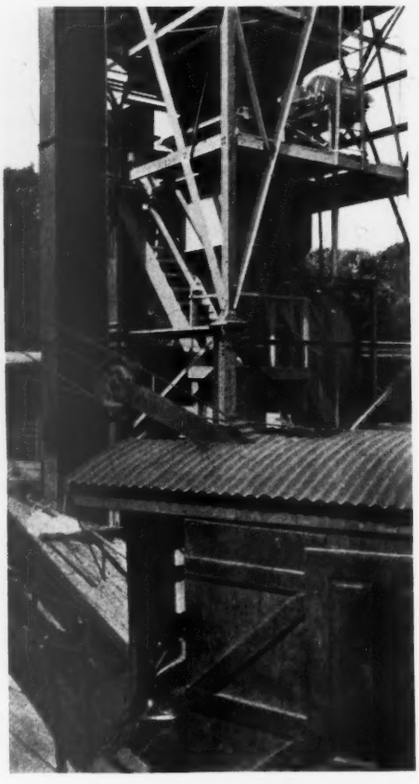
Using an aggregate material, the nature of which can be seen by referring to the illustration, the Ready Mixed Concrete Co. guarantee for 5 years any ready-mixed concrete they sell when placed according to their recommendations.

The operating officials have standardized on four mixes which are known as Nos. 1, 2, 3 and 4. They further guarantee strength to be as shown in the following table. Here also are shown some test data that the uathor took from the company's laboratory records at random and which are reproduced herewith to give an idea as to the quality of the concrete made. In every case the actual strength exceeded the guaranteed.

The company has a daily output of 200 cu. yd. and is able to supply both the largest Class A jobs and the smaller contractors as well. Its success can be traced directly to the confidence established by the thoroughness and conscientiousness of the laboratory testing which is so conducted that visitors at the plant can see for themselves that the efforts are not for display purposes but for definite assurance that the ready-mixed concrete shipped is "Certified Concrete" as the company's advertisements say it is.

GUARANTEED AND ACTUAL CONCRETE STRENGTHS

Mix No.	Cement-sand gravel ratio	Guaranteed strength lb./in.² 28-day	Actual strength lb./in.²	Remarks
1	1:3½	3500	5360	28-day
			4960	28-day
2	1:4	3000	3880	28-day
			4329	28-day
3	1:4½	2500	3120	28-day
			2280	7-day
4	1:5	2000	2640	7-day
			3920	7-day



Aggregate elevator, batcher bins and concrete mixer

A corner of the testing laboratory. The rack holds some of the concrete cylinders which are broken in regular manner to obtain strength data of various mixes

The "sand-gravel" aggregate is stored close to the main plant unit

The main units at the plant consist of a Blaw Knox batcher and a 2-cu. yd. Rex mixer using a Link-Chain Co. bucket elevator for the cement and a similar 60-ft. elevator for the sand and gravel. The elevator is supplied sand and gravel by a Thew ½-yd. gasoline clamshell mounted on crawler tread. This shovel also unloads the incoming cars of aggregate to ground storage. Later the company intends to build storage bins for the gravel. When these are in place a belt conveyor will be used to deliver gravel from the bins to the elevator. A 5-h.p. motor drives each of the two elevators and a 40-h.p. serves the mixer.

Cement is now purchased in sacks but the ultimate method of handling has not been worked out. The company owns seven Chevrolet trucks with 1½-cu. yd. bodies which haul only 1-cu. yd. each and in addition has three Mack trucks with 70 cu. ft. "bath-tub" type bodies, a type of body made by the Standard Steel Truck Co. of Kansas City, Mo.

The Ready-Mixed Concrete Co. is at present the only ready-mixed concrete operation of its kind in the city of Omaha. The office of the company is at the plant, John Kerns is president; M. W. Watt, secretary; V. C. Olsen is manager; E. L. Hoyt, representative of the Omaha Testing Laboratories, is

stationed at the plant laboratory to supervise all testing and assists the management in putting over this educational campaign.

Concrete Waterproofing Compounds

THERE is in progress at the U. S. Bureau of Standards an investigation of the effects of a representative number of the many commercial damp proofing and waterproofing compounds that are used in practice to decrease the permeability of concrete. Before the actual investigation of the compounds was started a study of the permeability of plain concrete, without admixtures or coatings, was necessary to determine the type of mixture, methods of fabricating, and the curing, etc., which were to be used in the specimens under investigation. To show the relative merits of the various admixtures and coatings, it was essential to develop a concrete that was permeable to a slight degree and then use this mix in all the specimens that contained the waterproofing compounds.

Specimens 4-in. thick were made using 12 mixes of concrete, ranging from 1:1:5 to a 1:4:6 mix and tested for permeability. The water-cement ratio and the size grading of the sand and gravel were varied for each of these mixes. The tests on these varied mixes showed that a mix of dry consistency was too permeable, but a mix which was wet enough to be workable was practically impervious. The medium flow between these two extremes, which allowed a small amount of water to pass through the specimen, could not be obtained by control of the water alone, so the thickness of the specimen was changed.

It was finally decided to use a specimen 2-in. thick, consisting of 1 part of cement, 3 parts of Potomac River sand, 6 parts of ¼- to ⅜-in. gravel, and a water-cement ratio of 1.175, as a standard. This mix is put into a cylinder mold 5-in. in diameter and bumped on the flow table instead of puddling or tamping.

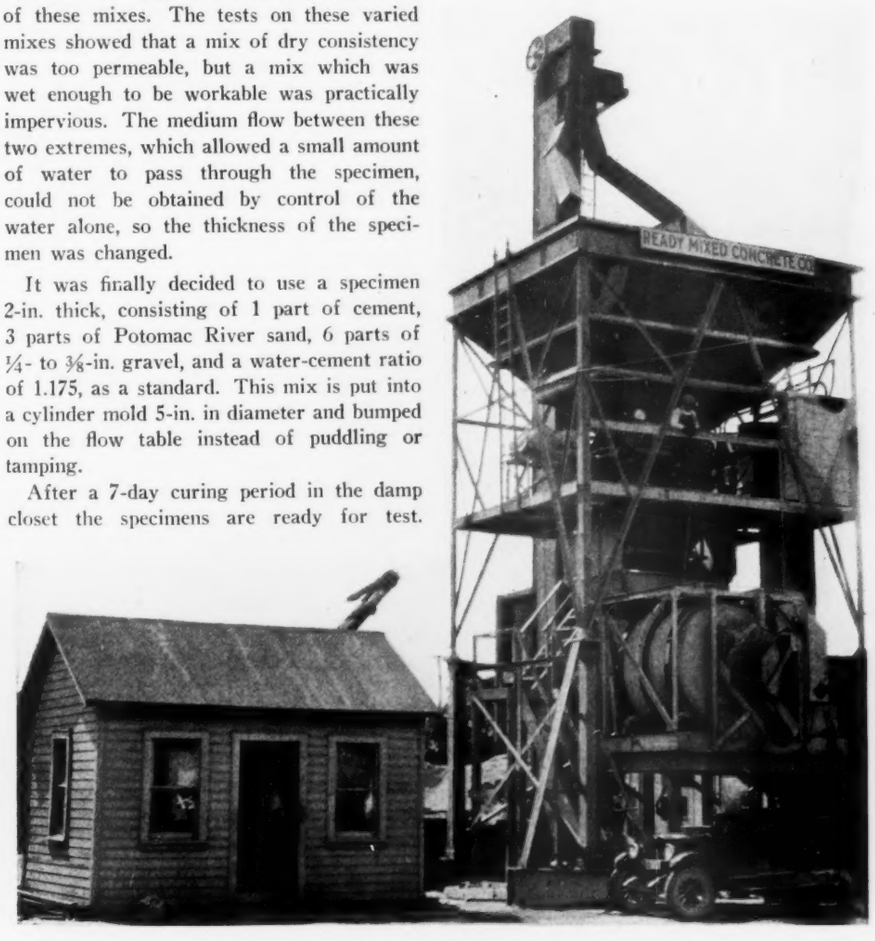
After a 7-day curing period in the damp closet the specimens are ready for test. They are placed between two pipe flanges carrying rubber gaskets and tightened so that there is no leakage around the edges. A water pressure of 20 lbs./in.^{2} is then put upon the specimen, and the amount of water passing through it in a specified time is recorded. The permeability will be determined at various times up to one year, but the pressure on the specimens will be maintained at 20 lb. at all times.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Ready-Mixed Concrete Plant Opened at Meadville, Penn.

THE RECENTLY completed ready-mixed concrete plant, built and operated by the Keystone Construction Co., Meadville, Penn., was recently put into production. The plant, designed and built by the Blaw-Knox Co. of Pittsburgh, was furnished by the C. H. Arnold Co. of Pittsburgh. It consists of a 110-ton steel bin with three compartments which contain sand and two sizes of gravel. Underneath this bin is a triplex weighing batcher of 2½-ton capacity which weighs three types of aggregates at once.

An automatic water measuring tank to accurately control the amount of water going into each batch and mixing drum makes up the balance of the plant.

Materials at the plant are unloaded by a steel derrick, stiffleg type, 20-ton capacity, erected by the Mead-Penn Iron Co. of Meadville. Delivery is made by the Keystone company's fleet of 12 trucks.—*Meadville* (Penn.) *Tribune-Republican.*



The ready-mixed concrete plant of the Ready-Mixed Concrete Co., Omaha, the only operation of this type in the city

Asbestos Shingles by a New Process

THE PATEE ASBESTOS SHINGLE CO. will be manufacturing asbestos shingles and chimneys in a short time. This new shingle is made without the use of portland cement and will be the first and only asbestos shingle made in America without the use of that product. All other asbestos shingles are made from approximately 15% asbestos and 85% portland cement, while the Patee shingle will consist of 90% asbestos and a binder produced in Natrona county, Wyoming. The Patee shingle, according to Mr. Patee, can be manufactured for less than any other such shingle in the world.

The new plant is located on Yellowstone highway, just east of Casper Packing Co.'s plant, and occupies a plot of ground of five acres. The site was formerly owned by the Independent Crude Oil Purchasing Co. and is fully equipped with railway shipping facilities on both the Burlington and Northwestern railways. A corrugated iron building is already on the property and an addition will be built immediately, 35x60 ft. Structural iron for the base of a 200-ton press has been installed.

The crushing plant, which is now in use for crushing the ore for asbestos chimneys, will be moved into the new location when the plant will be ready for operation. For the present raw material will be trucked from Casper Mountain to the plant, but in time an aerial tramway is planned from the top of the mountain to carry the ore to the crushing plant direct.

Very good freight rates have been secured for the shipment of shingles to all sections of the country and there is no doubt but that a good market awaits the product. Mr. Patee is very optimistic concerning the ultimate outcome of the project.—*Casper* (Wyo.) *Inland Oil Index.*

Concrete Masonry Construction

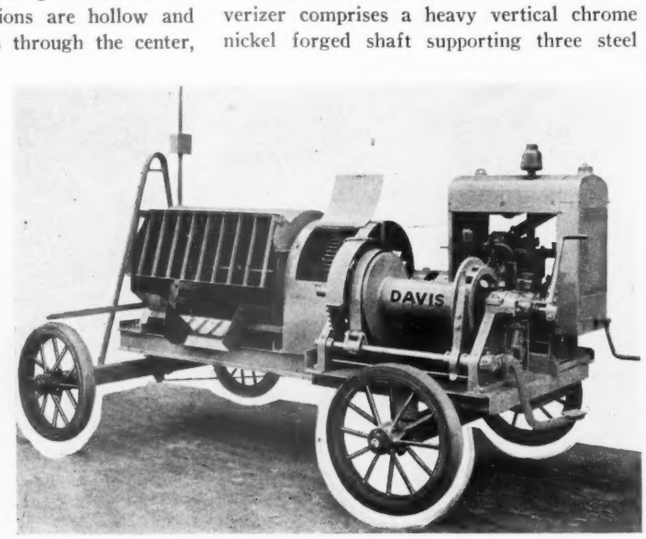
GOOD construction practice is discussed in detail in the recent booklet, "Concrete Masonry Construction," prepared by the Portland Cement Association, Chicago, as an aid to building contractors, architects and others interested in building.

Estimating data for concrete masonry on the 100 sq. ft. of wall area basis, and sheets of construction details covering such important subjects as standard sizes of concrete block and building tile, wall and window construction, roofs, floors and portland cement stucco are included in the booklet.

New Machinery and Equipment

New Plaster and Mortar Mixer

A NUMBER of concerns in San Francisco are now using a new plaster and mortar mixer perfected by Norris K. Davis of San Francisco which has several novel features, one being the mixing drum of all steel construction, built up of a rolled plate center welded to two flanged reinforced boiler plate heads. In the center of the heads two cast trunnions are bolted which provide the means of turning the drum in its bearings. These trunnions are hollow and the paddle shaft passes through the center, clear of the drum, where it is supported in special outboard bearings independent of the trunnions or drum bearings. This method prevents material from coming in contact with the paddle shaft bearings. As an extra safeguard the drum bearings are packed as a seal against water and grit, although the condition of the drum bearing does not affect the position of the drum shaft in any manner whatsoever. To clean the drum, it is titled backwards to the cleaning stop, and, while the blades are revolving, the drum is hosed out, the water draining out on the loading side.



New plaster and mortar mixer

The mixing blades are of steel, rotating at a speed of 25 r.p.m. and so designed that they cut into, through and under the material turning it from one end of the drum to the other and back. Each revolution, turns out a batch in ninety seconds or less.

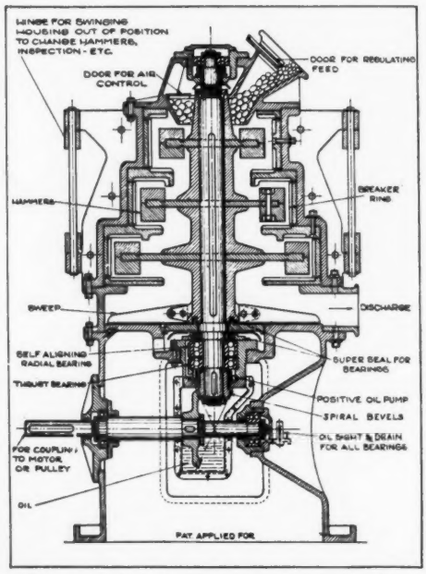
The machine is claimed to mix correctly, thoroughly and quickly, hardwall or lime plaster (both with as much fiber as desired), cement finish, sand finish and all kinds of stucco and brick mortar.

One of the special features is the hoist arrangement, for elevating the mixed batch. The charging height of the machine is very low, a feature appreciated by every operator. A twin-disc cluth is enclosed in a dust-proof housing bolted to the engine, and requires only ordinary attention. The two sack outfit is mounted on a four-roller-bearing, heavy duty wheels with industrial rubber tires. Gear drive is used to transmit the power from engine through countershift to mixing drum paddle shaft.

New Pulverizer Uses Impact and Attrition Action

AN improved type of impact-attrition pulverizer, claimed to be suitable for fine pulverizing of limestone, hydrated lime, coal and other rock products, is now being marketed by George F. Pettinos, Philadelphia, Penn. The new machine is said to produce uniformly fine products without the need of air separation.

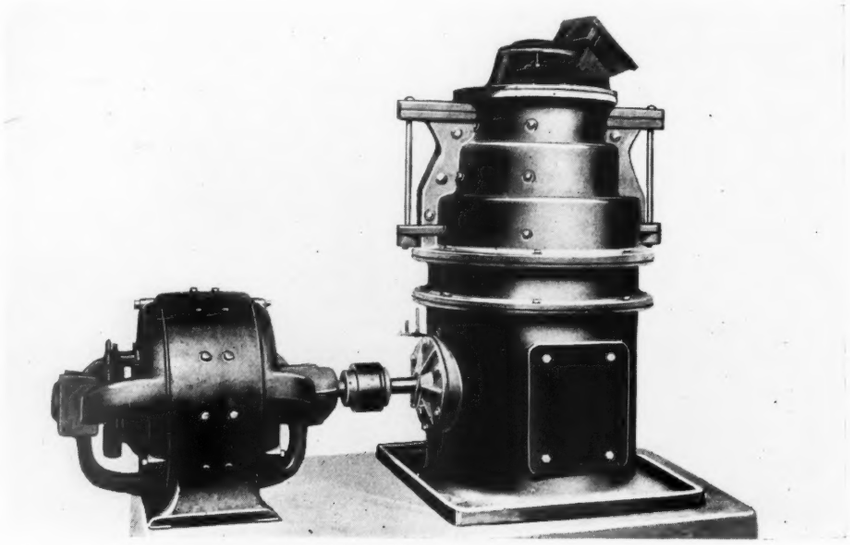
The construction of the "Whirlwind" pulverizer comprises a heavy vertical chrome nickel forged shaft supporting three steel discs upon which are firmly bolted chrome nickel alloy hammers. Each disc with its set of hammers revolves in its individual pulverizing chamber, which consists of a corrugated alloy breaker ring, concentric with the disc. Each chamber is separated from the adjoining chamber by corrugated ledge plates, both at the top and bottom.



Construction details of new pulverizer

A horizontal shaft transmits rotation to the vertical shaft through spiral bevel gears, the ratio of which may be made to accommodate motor, turbine or belt drive. The case is vertically split for accessibility.

Material up to 1½ in. size is fed in at the top of the machine and discharged in a pulverized state. Due to the construction details, the pulverizer itself is said to act as a separator and hold back all materials until they reach the desired fineness.

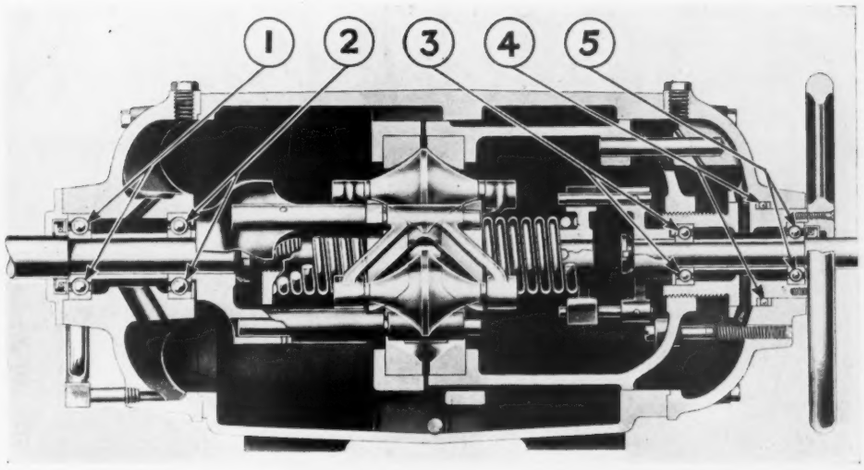


New pulverizer direct-connected to electric motor

Speed Changer Now Equipped with Ball Bearings

STEPHEN-ADAMSON Manufacturing Co., Aurora, Illinois, manufacturers of the JFS variable reducer transmission, announce the improvement of the machine by the incorporation of ball-bearing mountings throughout the entire machine. All sizes and types have been equipped with five ball bearings in each frame at vital points. In addition to providing a new degree of smooth operation, the lubrication of every running part is said to be positively assured. The internal circulation of the oil bath is accomplished through the actual splashing of the revolving parts.

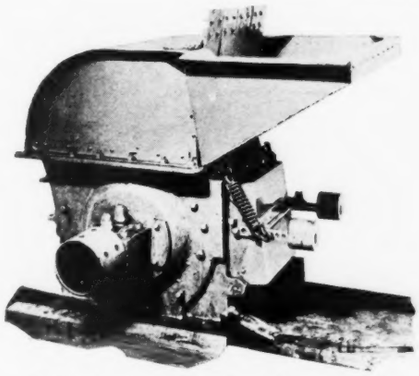
There are two ball bearings supporting the high speed shaft and two supporting the variable speed shaft. The oil drain in each bearing cavity is at sufficient height to insure a constant supply of lubricant at all times.



Cross-section illustration indicating positions of ball-bearings in speed changer

Automatic Apron Crusher or Pulverizer

A ROTARY jaw crusher combined with an automatic apron for ejecting foreign material, preventing overload, clogging or irregular feeding is featured in the so-called automatic apron crusher or pulverizer, manufactured by the A-A Crusher and Pulverizer Co., New York City. The machine is of all-steel construction and is recommended by the manufacturers for use in the rock products industry as a non-clogging pulverizer of limestone, lime, shale, coal and other nonmetallics.



Pulverizer equipped with automatic apron ejector

The feed opening of the machine is of sufficient size to take man-size stone, reducing this, it is claimed, to the required size, in one operation. Discharge is through the bottom of the crusher or through the apron where especially fine material is required. Air separation devices can replace the automatic apron if desired. The entire machine has a dust-proof housing.

All moving parts are readily accessible and easy to replace, according to the manufacturers. For rough crushing in open bottom machines, the fingers are replaced by a solid wall in the automatic apron which serves as an inspection door and safety gate. Variation of the grate bar openings and the distance between the bars and grinding sections permits different size products to be made. This feature also allows the same housing to be converted from a pulverizer to a coal crusher, merely by changing the grinding equipment.

Some of the rated capacities of the different sizes of this crusher are listed below.

CAPACITIES PER HOUR IN TONS OF PULVERIZERS

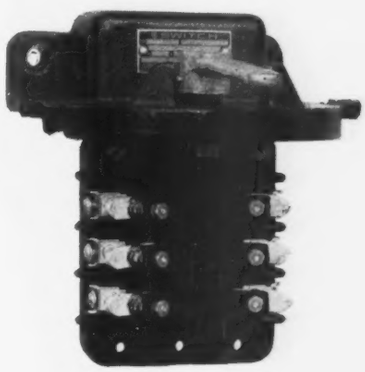
Type	Minim'm H.P.	R.P.M.	Weight	R.O.M. East. Bit. Coal to 98% ¾-in. prod.	R.O.M. East. Bit. Coal to 98% ⅛-in. prod.	R.O.M. West. Bit. Coal to 85% ¾-in. prod.	R.O.M. West. Bit. Coal to 85% ⅛-in. prod.	Shale to ½-fr. 12-in.	Limestone 4- to ⅛-in.	Limestone 6- to ¼-in.
Xp	3-7	1200	1200	5	3	4	2.5	2	1-1.5	3
R	10-25	900	3200	40-50	20-25	35	15	8	6	10
Y	30-50	900	4400	75-100	50-75	75	25	25	15	25
E	60-75	720	9200	125-175	75-100	90	60	40	30	50
W	85-150	600	17000	275-300	150-175	175	125	60	60	100

Remarks: Capacities always depend on the moisture contents.

New Across-the-Line Switch Is Oil-Immersed

A NEW control device announced by the General Electric Co., Schenectady, N.Y., is a small, inexpensive, oil-immersed switch for use in throwing small alternating or direct-current motors across the line. It is a simple device having a minimum of component parts, including only a one-piece cast iron cover, with the switch mechanism, and a small, cast-iron tank for the oil. It is designated as the CR-2960-SY-105.

The molded compound switch base carries the stationary contact stud parts, and the moving contact assembly is mounted on another one-piece moulded part. The contacts are of the silver-to-silver, double-break type. The use of these contacts and of the molded arm eliminates shunts or drum type contacts. The cover is provided with two mounting holes making the switch suitable for wall mounting. Provision is made for conduit connection by means of an incoming conduit box cast into the cover. The molded switch base is bolted to the cover. The cover has a groove, lined with felt, into which the top of the tank fits, thus providing a tight installation. The tank is held in place by bolts with wing nuts. The handle is of malleable iron.



Details of small across-the-line oil-immersed switch

The advantages claimed by the manufacturer are: (1) Double-break, separately insulated contacts, free from shunts or drum fingers. (2) Molded insulation giving excellent creepages and clearances. (3) Simple and adequate means for mounting, and conduit connections.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Md.	.50– .75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Springs, W. Va.	.40	1.35	1.35	1.30	1.25	1.15
Munns, N. Y.	.75	1.25	1.25	1.15	.....	.....
Prospect, N. Y.	.80	1.20	1.20	1.15	1.10	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.65	1.25	1.05	.95	.85	1.00
Syracuse, N. Y.	.50	1.00	1.00	1.00	1.00	1.00
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.50	.....	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Cypress, Ill.	1.60	1.00	1.10	1.00	1.00	1.25
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.90	1.10	1.10	1.10	1.10	1.10
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05 1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.10	1.10
Lannon, Wis.	.90	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90–1.00	1.00–1.10	.90–1.00	.85– .90	.85– .90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	.....	1.10	1.05	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90–1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.....	.90	.90	.90	.90	.....
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	1.15
Chico, Texas	1.00	1.30	1.30	1.25	1.20	.....
Cutler, Fla.	.....	.50– .75r	.....	1.50–1.75r	.....	1.10r
El Paso, Texas	.50r	1.00–1.50	1.00–1.50	1.00	1.00	.75
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	.90	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.55	1.25	1.25	1.25
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35–1.40	1.40–2.10	1.80–1.90	1.50–1.60	1.50–1.60	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	.....
Toronto, Canada	.....	5.80	.....	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.....	.....	1.75	1.75	1.60	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	.....	.....	2.25–2.50s	.....	.....	.....
Lithonia, Ga.—Granite	.75	1.60	1.60	1.35	1.25	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	1.50 to 1.85					
Toccoa, Ga.—Granite	1.40	1.40	.....	1.30	1.30	1.30

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) High calcite fluxing limestone, 92–98% CaCO, 1.75. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carload prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard. (s) 1-in. and less, per cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 99% $CaCO_3$; .03% $MgCO_3$; 90% thru 100 mesh	5.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, 45% thru 200 mesh	a5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 94-98% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh	1.00
Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk	3.50
Paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25 cash 15 days)	
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton	6.00
90% thru 20 mesh, bulk, per ton	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.75; bulk	2.50
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk	1.75
Marl — Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk	2.25
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35–1.60
Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% & 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 101.12%; 60% thru 100 mesh	2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk	3.50
100% thru 4, 30% thru 100, bulk	1.50
Rocky Point, Va. — Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y. — Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk	2.75

(a) Less 50c comm. to dealers per ton.

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98.50% $CaCO_3$; 50% $MgCO_3$; 90% thru 10 mesh	1.50
30% thru 100 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh 1.00–1.25

Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags 4.50

Colton, Calif.—100% thru 16 mesh, bulk, 4.00; including sacks 5.00

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton 1.25
90% thru 4 mesh, per ton 1.10

Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; 90% thru 50 mesh ..... .95

Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh 1.00

Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 4% $MgCO_3$; 50% thru 100 mesh 1.50

Kansas City, Mo.—50% thru 100 mesh 1.00

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼ in. to dust) 1.00

Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00

McCook, Ill.—90% thru 4 mesh ..... .95

Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh 1.50

Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags 5.00

Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70

Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75

Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh 2.10

Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh 1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks 6.00

Hillsville, Penn., sacks, 5.10; bulk 3.50

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra) 3.50

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks 4.25

Piqua, Ohio—99% thru 100 mesh, bulk, 3.50; in 80-lb. bags (f.o.b. Piqua) 5.00

Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50

Waukesha, Wis.—50% thru 100 mesh, bulk 2.10

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J. *1.75–2.25
Cheshire, Mass., in carload lots 5.00–7.00
Estill Springs and Sewanee, Tenn. 1.50
Franklin, Penn. 2.00
Klondike, Mo. 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .30– .35
Ohlton, Ohio 2.50
Ottawa, Ill. 1.25
Red Wing, Minn. 1.50
San Francisco, Calif. 4.00–5.00
Silica and Mendota, Va. 2.00
St. Louis, Mo. 2.00
Utica and Ottawa, Ill. 75–1.00
Zanesville, Ohio 2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.30	
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.50	.50	1.15	1.25	1.25	
Attica and Franklinville, N. Y.	.65	.65	.65	.65	.65	.65
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.00	1.05	1.05			
Erie, Penn.	.65	.90	1.30	1.30	1.30	
Leeds Junction, Me.		.50	1.75		1.25	1.00
Machias Jct., N. Y.	.75	.75	.75		.75	.75
Milton, N. H.		.50				.90
Montoursville, Penn.	1.00	.75	.80	.75	.70	.70
Northern New Jersey	.50	.50	1.25	1.25	1.25	
Somerset, Penn.		2.00				
South Portland, Me.		1.00	2.25			2.00
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*		.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Appleton, Minn.		.50	1.25		1.50	
Attica, Ind.			All sizes .75–.85			
Barton, Wis.		.40s	.50s	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90n
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio		.75‖	.75‖	.75‖	.75‖	
Des Moines, Iowa		.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.40	.40	.55– .75	.85	.85	
Elkhart Lake, Wis.	.40	.30	.45	.50	.50	.50
Ferrysburg, Mich.		.50– .80	.60–1.00	.60–1.00		.50–1.25
Grand Haven, Mich.		.60		.90		.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		.85	.85		.85	
Hersey, Mich.		.50	.50	.70	.70	.70
Humboldt, Iowa	.50	.50	1.40	1.40	1.40	1.40
Indianapolis, Ind.	.50– .75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Mankato, Minn.	.55	.45	1.25		1.25h	
Mason City, Iowa		.60	.85	1.25	1.25	1.25
Mattoon, Ill.			.75–.85 all sizes			
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (g)	.35	.35	1.25	1.35	1.35	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55t	1.55	1.55	1.65
St. Louis, Mo.†	2.00e	2.00f	2.25t	2.25	2.25	2.35
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.50	.50				
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.50				
Fort Worth, Texas	1.00	1.00	1.00	1.00	1.00	1.00
Knoxville, Tenn.	.90	1.00	1.20	1.20	1.20	1.20
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.30	.30	1.00	1.00	.80	.80
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Los Angeles, Calif.	.30	.30	.80	.80	.80	.80
Oregon City, Ore.			All grades range from 1.00 to 1.25 per cu. yd.			
Otay, Calif.		.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60		1.25		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			.40			
Appleton, Minn.	.55					
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.35
Burnside, Conn.		.75*				
Chicago, Ill.	1.25m			.35		
Des Moines, Iowa				.85		
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Falls, Wis.					.65	
Fort Worth, Texas						.60
Gainesville, Tex.					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					.70	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35					
Mankato, Minn.	.70					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.				.60	.60	.60
Somerset, Penn.		1.85–2.00		1.50–1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.						.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¾-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Per yd., del. by truck, ¼-in. down, 1.25; 2 in. and less, 2.40. (h) ¾-in. and larger. (j) Lake sand, 1.75, delivered. (k) 60–70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.25	2.00	2.25	.....	.....	4.00	.....
Beach City, Ohio	1.75	1.75	.....	1.50	1.50	.....	.....
Cheshire, Mass.	Sand for soap, 7.00–8.00					6.00–8.00	.....
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00 1.25	.....	.....	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.50–3.00	.....
Elco and Murphysboro, Ill.	Water-floated ground silica per ton in carloads—18.00–31.00						
Estill Springs and Sewanee, Tenn.	1.25	.....	.....	1.25	.....	1.35–1.50	.....
Franklin, Penn.	1.75	1.75	.....	1.75	.....	.....	.....
Kasota, Minn.	.....	.....	.....	.....	.....	.....	1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00	.....	.....	2.75–3.00	.....
Klondike, Mo.	2.00	.....	.....	2.00	.....	.....	.....
Massillon, Ohio	2.25	2.25	.....	2.25	2.50	.....	.....
Michigan City, Ind.	.....	.....	.....	.30– .35	.....	.....	.....
Montoursville, Penn.	.....	.....	.....	1.50–1.60	.....	.....	.....
New Lexington, Ohio	2.00	1.50	.....	.....	.....	.....	.....
Ohlton, Ohio	1.75	1.75	.....	2.00	1.75	1.75	.....
Ottawa, Ill.	1.25–3.25	2.25	1.25–3.25	1.25–3.25	1.25	3.50	3.00
Red Wing, Minn. (d)	.....	.....	.....	.....	1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	.....
Silica, Mendota, Va.	.....	Potters sand, 8.00–10.00g		.....	.....	.....	1.75
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70	.....	.75	1.00	.....	.....
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h	.....	1.50*–2.00h	.....	.....	.....
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00	.....	.....

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25	.....	1.50	.....	.....	.....
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	.....	1.30*	.....	1.45*	1.45*	1.45*	.....
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	.75	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*	.....	1.15*	.90*	.90*	.....

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.	.....	.....	12.00	.....	.....	.....	.....	2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Lime Ridge, Penn.	.....	.....	.....	.....	.....	.....	5.00	.....
West Stockbridge, Mass.	12.00	10.00	5.60	.....	.....	.....	.....	2.00[13]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00	.....	7.00	9.00	5.00	.....
York, Penn., & Oranda, Va.	11.50[7]	8.50–9.50[7]	8.50–9.50[7]	8.50–10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.	.....	.....	.....	.....	.....	10.75	7.50	12.11
Carey, Ohio	11.50	7.50	7.50	.....	8.00	.....	7.50	1.50
Cold Springs, Ohio	.....	7.50	7.50	.....	.....	.....	.....	.....
Gibsonburg, Ohio	11.50	.....	.....	.....	8.00	10.00	.....	.....
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio	11.50	.....	.....	.....	.....	.....	.....	.....
Milltown, Ind.	.....	8.50–10.00	.....	10.00[8]	.....	.....	8.50[22]	1.35[16]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[16]
Scioto, Ohio	10.50	7.50	7.50	8.50	8.00	.62½	7.00	1.50
Sheboygan, Wis.	.....	10.50	.....	.....	.....	.....	9.50	2.00[4]
Wisconsin points[6]	.....	11.50	.....	.....	.....	.....	9.50	.....
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[9]
SOUTHERN:								
El Paso, Texas	.....	.....	.....	.....	.....	.....	7.00	1.50
Frederick, Md.	.....	8.00–9.50	8.00–9.50	.....	.....	9.50[15]	7.00[16]	.....
Graystone & Landmark, Ala.	12.50	9.00	.....	12.50	8.50	.....	7.50	1.35
Keystone, Ala.	.....	9.00	8.00	9.00	9.00	11.00	7.50	1.35
Knoxville, Tenn.	19.00	9.00	9.00	9.00	6.00	.67½	6.00	1.35
Ocala and Kendrick, Fla.	.....	11.00	.....	.....	.....	.....	.....	.75[21]
WESTERN:								
Kirtland, N. M.	.....	.....	.....	.....	.....	.....	10.00	.....
Los Angeles, Calif.	15.00	14.00	12.00	18.00	.....	.....	13.50	.....
San Francisco, Calif.	19.00–19.50	15.00–17.50	13.00	17.00–19.00	14.50[20]	.90[17]	14.50[19]	1.85[17]
Tehachapi, Calif.[18]	10.80	.....	6.75[11]	12.00	.....	.....	10.30	.....
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00	.....	18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [16] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] To mortar plant and large industrials, 13.00. [20] Also 13.00. [21] Per ½-bbl. bag. [22] To 9.00. [23] Per bbl., 2.15. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio	.....	2.00
Zanesville, Ohio	.....	2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc, per ton	5.00–10.00
Ground talc (20-50 mesh), bags	7.00– 9.00
Ground talc (150-200 mesh), bags	10.00–12.00
Pencils and steel crayons, gross	1.50– 3.00
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags (bags extra)	8.00– 8.50
Same, including 50-lb. bags	9.00– 9.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Clifton, Va.:	
Crude talc, per ton	4.00
Ground talc (150-200 mesh), in bags	12.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
Crude talc, 325 mesh	14.75–16.00
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.00
Ground talc (150-200 mesh), bags	6.25–10.50
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Los Angeles, Calif.:	
Ground (200 mesh), in bags	14.00 25.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock	
Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 68-70%	4.00– 4.50
Mt. Pleasant, Tenn.—B.P.L., 77%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00
Ground Rock (2000 lb.)	
Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65–70%	3.75– 4.50
Mt. Pleasant, Tenn.—Lime phosphate:	
B.P.L., 72.50%, 80% thru 300 mesh	11.70
B.P.L. 72%	5.00
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)
(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Bedford, N. Y.—Mine scrap	12.50–14.70
New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	27.00
Mine scrap	20.00
Roofing mica	38.00
Punch mica, per lb.	.05– .12
Trimmed mica; 50% disc. from list, per ton, 20 mesh, 32.50; 40 mesh, 38.00; 60 mesh, 40.00; 100 mesh, 60.00; 200 mesh	70.00

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream, and American Botticino, coral pink, pearl blush	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	$3.00	$3.00
Crown Point, N. Y.—Mica Spar	¶9.00–‖12.00	
Davenport, Ia.—White limestone, in ba	6.00	6.00
Easton, Penn.—Royal green	16.00–18.00a	
Harrisonburg, Va. — Bulk marble (crushed, in bags)	12.50–14.00	12.50–14.00
Ingomar, Ohio — Concrete facings and stucco dash		11.00–18.00
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white	‖9.00–¶10.00	
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50
Phillipsburg, N. J.—Royal green granite		18.00–20.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		7.90– 8.40
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.	b5.00	

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh 19.00

DeKalb Jct., N. Y.—Color, white; analysis, K_2O, 2.11%; Na_2O, 6.86%; SiO_2, 74.04%; Fe_2O_3, .063%; Al_2O_3, 14.59%; pulverized, 100% thru 200 mesh, soda spar, in bags, per ton, 22.00, bulk 20.00; 100% thru 140 mesh, in bags, per ton, 20.00; bulk 18.00

Bedford Hills, N. Y.—Color, white; analysis, K_2O, 12.26%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; pulverized 78% thru 100 mesh, bulk, 11.00–14.00; crude, bulk, per ton 9.00

Trenton, N. J.—White; analysis, K_2O, 11%-13%; Na_2O, 1.5%-2.70%; SiO_2, 63%-67.80%; Fe_2O_3, .09%; Al_2O_3, 18.25%-20%; pulverized, 99.5% thru 200 mesh 20.00

Rochester, N. Y. 22.00

Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk 11.00–12.50

Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk 15.75–22.50

Pulverized, 20% thru 80 mesh; bags, 17.60; bulk 16.50

Rumney and Cardigan, N. H.—Color, white; analysis, K_2O, 9-12%; Na_2O, trace; SiO_2, 64-67%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Rumney Depot, N. H.—Color, white; analysis, K_2O, 8-13%; Na_2O, 1-1¼%; SiO_2, 62-68%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Penland, N. C.—White; crude, bulk 8.00

Ground, bulk 16.50

Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk 18.00

(Bags 15c extra.)

Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra) 18.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per sack	1.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, O. (b)—(Pearl Grit), fine and medium, per ton	¶8.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	7.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

(a) F.o.b. Middlebury, Vt. (b) F.o.b. Piqua, Ohio.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	‖13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	13.00–17.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	15.00†e
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (e) Delivered. (f) In yard, 12.00–12.50; also 12.25. (h) Also 15.50. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.86¼	3.45	.....
Atlanta, Ga.	.....	2.26	3.16¶
Baltimore, Md.	.....	2.25–2.65	3.55¶
Birmingham, Ala.	.....	1.90	2.80¶
Boston, Mass. (g)	.57e	1.88–2.08	3.27¶
Buffalo, N. Y.	.62½	†2.10–2.33	3.40¶
Butte, Mont.	.90¼	3.61	.....
Cedar Rapids, Iowa	.....	2.24	.....
Charleston, S. C.	.....	2.25–2.55d	3.15¶
Cheyenne, Wyo.	.66½	2.66	.....
Chicago, Ill.	.....	2.05–2.45	3.35¶
Cincinnati, Ohio	.....	2.17–2.57	3.47¶
Cleveland, Ohio	.....	2.14–2.64	3.54¶
Columbus, Ohio	.....	2.22–2.62	3.52¶
Dallas, Texas	.....	1.80	3.39¶
Davenport, Ia. a	.....	2.24	.....
Dayton, Ohio	.....	2.21–2.61	3.51¶
Denver, Colo.	.66¼	2.65	.....
Des Moines, Iowa	.....	2.14	.....
Detroit, Mich.	.....	1.95–2.35	3.25¶
Duluth, Minn.	.....	2.04	.....
Houston, Texas	.....	1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09–2.49	3.39¶
Jackson, Miss.	.....	1.94–2.34	3.24¶
Jacksonville, Fla.	.....	2.51b	3.26¶
Jersey City, N. J.	.....	2.13–2.53	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.51½	2.06	.....
Louisville, Ky.	.55½	2.47	3.37¶
Memphis, Tenn.	.....	1.94–2.34	3.24¶
Milwaukee, Wis.	.....	2.20–2.60	3.50¶
Minneapolis, Minn.	.....	2.12–2.22	.....
Montreal, Que.	.....	1.60	.....
New Orleans, La.	.45½	1.82	3.22¶
New York, N. Y.	.60¾	1.93–2.43	3.33¶
Norfolk, Va.	.....	1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.	.....	2.22	.....
Pittsburgh, Penn.	.....	2.05–2.45	3.35¶
Philadelphia, Penn.	.....	2.15	3.45¶
Phoenix, Ariz.	.....	3.91*	.....
Portland, Ore.‡	.....	2.40–2.90a	.....
Reno, Nev.‡	.....	2.91–3.41a	.....
Richmond, Va.	.....	2.32–2.72	3.62¶
Salt Lake City, Utah	.70¼	2.81	.....
San Francisco, Calif.‡	.....	2.21–2.71a	.....
Savannah, Ga.	.....	2.51c	3.15¶
St. Louis, Mo.	.48¾	1.95–2.35	f3.25¶
St. Paul, Minn.	.....	2.12–2.22	.....
Seattle, Wash.	.....	†2.50–2.65j	f3.50†
Tampa, Fla.	.....	2.40	3.30¶
Toledo, Ohio	.....	2.20–2.60	3.50¶
Topeka, Kan.	.50¾	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.	.....	2.12–2.52	3.42¶
Winston-Salem, N. C.	.....	2.19–2.59	3.49¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

Albany, N. Y.	.43¾	1.75	.....
Bellingham, Wash.	.....	2.10	.....
Buffington, Ind.	.....	1.80	.....
Chattanooga, Tenn.	.....	2.45*	.....
Concrete, Wash.	.....	2.35	.....
Davenport, Calif.	.....	2.05	.....
Hannibal, Mo.	.....	1.90	.....
Hudson, N. Y.	.....	1.75	.....
Leeds, Ala.	.....	1.65	.....
Lime and Oswego, Ore.	.....	2.50‡	.....
Mildred, Kan.	.....	2.35	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.75	.....
Richard City, Tenn.	.....	2.05	.....
Steelton, Minn.	.....	1.85	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.80	.....

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 15c bbl. refund for paid freight bill. (c) 26c bbl. refund for paid freight bill. (d) 30c bbl. refund for paid freight bill. (e) Paid freight bill taken as part payment of invoice. (f) "Velo" cement, including cost of paper bag. ¶ "Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. (g) Also 2.33 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Delawanna, N. J.	.....	.....	.....	4.50–5.00	13.10–14.00	5.00	.....	7.25	.....	.....	.....	.....	25.00
East St. Louis, Ill.	Special Gypsum Products—Interior partition section, 4 in. wide, 12 in. thick and up to 10 ft. 6 in. long, per ton, 21.00; 6x6 in. and up to 10 ft. 6 in. long, per ton, 30.00; floor section, 7x16 in. and up to 13 ft. 6 in. long, per ton, 23.00.												
Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00	.....	15.00	20.00–25.00
Los Angeles, Calif. (f)	3.50–5.00	6.00–8.00	6.00–8.00	7.50–8.50	7.50–10.00	.....	8.00–10.00	.....	26.90	.....	.....	.....	.....
Medicine Lodge, Kan.	.....	.....	.....	.....	.....	.....	.....	.....	15.00	.....	.....	.....	.....
Oakfield, N. Y.	2.50	.....	.....	5.50	6.00	6.00	.....	5.50	.....	.....	.....	15.00	25.00
Providence, R. I. (x)	.....	.....	.....	12.00–13.00o	.....	.....	.....	.....	.....	.....	Partition block, solid reinforced, 12x30x3", 7c per sq. ft. in truck lots		
Seattle, Wash.	.....	.....	.....	10.50m	12.00m	13.00	.....	14.00	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00w	.....	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable. (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (f) plasterboard, 18c to 20c per yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail, 35.00; (w) 16x48; (x) 2- and 3-in. "Fabricaste" gypsum blocks, 6–7c per sq. ft.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	16.50
Cement City, Mich.	55.00¶
Chicago District‖	180.00–210.00a
8x10x16	230.00–260.00a
8x12x16	280.00–330.00a
Columbus, Ohio	15.00c– 17.00†
Detroit, Mich. (d)	.15– .17†
Forest Park, Ill.	21.00*
Grand Rapids, Mich.	11.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.	4x8x12–5.00*
Olivia and Mankato, Minn.	9.50b
Somerset, Penn.	.18– .20
Tiskilwa, Ill.	.16– .18†
Yakima, Wash.	20.00*

*Price per 100 at plant. †Rock or panel face. ‡Delivered. ¶5x8x12, 55.00 per 1000. (a) Face. (b) Per ton. (c) Plain. (d) 8x12x16, rock or panel face, .24–.26.

Cement Building Tile

Camden and Trenton, N. J.:	
3x8x16, per 100, 9.00; 3x9x16, per 100	9.00
4x8x16, per 100, 12.00; 4x9x16, per 100	13.00
6x8x16, per 100, 16.50; 6x9x16, per 100	15.50
Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50–10.00; green or blue, per sq.	11.50–12.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.0c
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	.....
Chicago District "Haydite"	14.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	.....
Ensley, Ala. ("Slagtex")	12.50	.....
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	.....
Milwaukee, Wis.	14.00	32.00
Mt. Pleasant, N. Y.	.....	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	15.50	.....
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	26.50	45.00	53.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	.....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	56.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.	.....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh (94-96% thru 300 mesh), $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue-grey, bulk, 6.00 per ton (10c additional per 150-lb. bag). Grey, 6.50 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	3/8-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. mediums	9.50–11.25	.....	.....	.....	.....	.....
No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Albion mediums	8.00– 9.00	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—No. 1	8.50–11.25	(Vari-tone, 12.00–13.00)				
Medium	7.75– 9.00	.....	.....	.....	.....	.....
Hard vein	.....	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	.....	.....	.....	.....
Pen Argyl, Penn.*						
Graduated slate (blue)	.....	16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)	.....	18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 10.50–12.50; textural, 12.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	12.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., 18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Paulina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Tacoma, Wash.	.15	.17	.22½	.30	.40	.55	.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.85½	.....	114	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced (c) Delivered on job; 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

New York State Crushed Stone Association Holds June Meeting

THE JUNE meeting of the New York State Crushed Stone Association was held at Trout Brook Inn, about 20 miles north of Utica, N. Y., on Thursday, June 27. This location is on the route to the Adirondack Mountains and is a delightful little spot not far from the L. and M. Stone Co.'s plant and needless to say offered so many diversions from a pleasure standpoint that the seriousness of producing crushed stone was for the most part forgotten.

Eighteen members gathered at the inn during the morning hours and passed the time in "swapping yarns" and in playing the time honored game of "horseshoes." No official scores were recorded, but Messrs. Dodds of the Gouverneur Limestone Co. and Caldwell of the Genesee Stone Products Co. appeared to have the edge in making "ringers."

At 1 p. m. dinner was served on the spacious veranda overlooking the glen and the then hungry rock men did full justice to the generous portions of frogs legs, brook trout and fried chicken allotted to them.

At the completion of the meal President Savage called the business meeting to order. Secretary Owens read the minutes of the previous meeting at Rochester, which were duly approved by vote.

Following this came a rather lengthy discussion of general conditions in the industry in which practically everyone participated. W. L. Sporborg then advised of a communication from J. R. Boyd concerning approximate annual tonnages of New York state producers and prepared a tabulation of data for later submission to Mr. Boyd.

Mr. Savage and Otho Graves then spoke of the coming national directors meeting at Atlantic City next month, at which time the place of the 1930 national convention would be chosen. They explained that New Orleans, St. Louis, Memphis and Atlantic City were being considered and suggested that it would be helpful to the directors to have the New York association express its preference as to a city. After some discussion a vote was taken and this disclosed the body's preference for New Orleans as first choice and St. Louis as second. It was qualified of course upon facilities and ability to draw the greatest attendance at the convention and will be offered as a suggestion to the directors at Atlantic City on those conditions.

The place of the July meeting then received attention and the meeting voted to accept the invitation of D. N. Boice of the Genesee Stone Products Co. to meet at his estate in Churchville on Friday, July 19. This will be the high spot of the summer meetings and will include games and contests for all present. Superintendents and operating men will be invited to this meeting which is expected to break all previous attendance records. Among the contests will be a tennis match between Mr. Graves and Mr. Boice for the championship of the association.

After more discussions of a minor nature the meeting adjourned at 5 p. m.

Attendance

Adams and Duford Co., Chaumont, N. Y., E. L. Johnson.
Buffalo Crushed Stone Co., Buffalo, N. Y., A. L. Hooker, James Savage.
General Crushed Stone Co., O. M. Graves, Grover J. Murphy, George E. Schaefer.
Genesee Stone Products Co., Batavia, N. Y., D. N. Boice, A. B. Caldwell.
Gouverneur Limestone Co., Gouverneur, N. Y., G. W. Dodds, H. H. Hodgkin.
L. and M. Stone Co., Prospect, N. Y., William McGrew.
LeRoy Lime and Crushed Stone Co., LeRoy, N. Y., D. L. Moore, Duane Moore.
Peerless Quarries, Inc., Utica, N. Y., A. S. Owens.
Rock-Cut Stone Co., Syracuse, N. Y., F. C. Owens, A. G. Seitz, W. L. Sporborg.
F. W. Schmidt, Morristown, N. J.
Morris M. Harrigan, E. I. Du Pont de Nemours and Co.
Mrs. Duane Moore.

John D. Owens

JOHN D. OWENS, one of the pioneers in the development of Marion county's lime and stone industry and a leader in other industrial and business affairs of national scope over a long period of years, died on June 24 following an illness of two weeks. His death came unexpectedly, complications resulting from his illness, having affected his heart. He was 72 years of age.

He was the son of John Owens, founder of the village of Owens, five miles south of Marion, where the father started the Owens lime and stone business in 1850. It was in this enterprise that John D. Owens began his long career as a business and industrial leader. His connection with the lime and stone business at Owens dates back to his boyhood, when at the age of 12 he started as a driver of one of the wagons which carried limestone to the kilns. In later years the son became associated with his father in management of the business and after the father's death took over entire control.

Mr. Owens' interests were centered in the lime and stone business until 1910, when he purchased the Prospect National Mills. This business was acquired under the name of John D. Owens and Son, his son, Clifford A. Owens, having been taken into partnership in 1905. Since that time most of his business and industrial activities were in connection with this partnership. The stone quarries and lime business at Owens are operated under the partnership name.

In 1911 organization of the Osgood company was effected under the leadership of John D. Owens and in 1914 the ownership and management of this company passed into the hands of John D. and Clifford Owens.

In 1928, Mr. Owens organized the Commercial Steel Castings Co. and in 1926 purchased the property of the defunct Fairbanks Steam Shovel Co., and shortly afterward organized the Alloy Cast Steel Co. and the General Excavator Co. for operation of the newly acquired plant. The Power Manufacturing Co. was the fifth local industry acquired by the Owens interests, this enterprise having been merged with the Osgood company just recently.

John D. Owens continued as active executive head of the various enterprises with which he was connected until 1920 and since that time he had been serving in an official advisory capacity, executive management having been taken over by his son.

Mr. Owens was one of the organizers of the National City Bank and Trust Co. and served as a member of its board of directors. In addition, he was a member of the partnership of Owens and Tobin, which operates the Owens' farms of approximately 1500 acres, one of the largest agricultural and dairy enterprises in this section of the state.

John D. Owens was born November 12, 1856, in a log cabin on a site now a part of the village of Owens. The building is still standing on its original site.

He was married in Marion on January 19, 1882, to Miss Mary Belle Osborne. He is survived by Mrs. Owens and by one son, Clifford A. Also surviving him are two sisters, Mrs. Mary Jane Evans and Mrs. Margaret Shurz, both of Marion.

Mr. Owens was a member of Marion Lodge No. 70, Free and Accepted Masons; Marion Chapter, No. 62, Royal Arch Masons; Marion Council, No. 22, Royal and Select Masons; Marion Commandery, No. 36, Knights Templar, and Scioto Consistory, Scottish Rite Masons, and Marion Lodge, No. 32, B. P. O. Elks.

Work Started at Feldspar Mine

WORK at the Old Lick mica and feldspar mine at Spruce Pine, N. C., is progressing rapidly under the supervision of Julius Henline. This mine is located two miles east of Bakersville and was discovered 50 years ago. Some of the largest blocks of best quality mica ever mined in Mitchell county were taken from this mine.

The company having this work done has obtained a five-year lease from W. Vance Brown of Asheville and R. C. Guy of Newland, owners of the mine, and will install modern machinery at once. A cable line will be built from the mine to the road, a distance of about one mile, where their products can be loaded on trucks.—*Morgantown* (N. C.) *News-Herald.*

News of All the Industry

Incorporations

Drew Gravel Co., McGehee, Ark., dissolved.

Montana Phosphate Co., Seattle, Wash., $50,000. H. W. Boetzkes and H. C. Lake.

Ottawa Silica Moulding Sand Co., Chicago, Ill., dissolved.

Edgemont Gravel Co., Dayton, Ohio, $25,000; 750 shares, no par value. Harry Heier, W. S. Rhotehamel and L. Edgar Orendorf.

Clinton River Cement Products Co., Pontiac, Mich., $35,000. To manufacture and deal in portland cement, cement blocks and building materials.

Travart Stone Co., Brooklyn, N. Y., $10,000. To deal in building materials. G. J. Rhodius, Jr., 233 Broadway, Manhattan, N. Y.

Schellberg Fremont Sand and Gravel Co., Omaha, Neb., $50,000. George D. Schellberg and Helen J. Tell.

Mallo Sand and Gravel Co., Inc., Netcong, N. J., $100,000. Incorporators: King & Vogt, Morristown, N. J.

Lime Products Corp., Indianapolis, Ind., 1000 shares common, no par value. Max Robbins, Bessie Robbins and L. D. Buenting.

Quick Laid Block Corp., Baltimore, Md. To produce concrete building block. Director, G. Wilson Kellough, 3200 Westwood Ave., Baltimore.

Wilcox Sand and Gravel Co., Grants Pass, Ore., $25,000. Roy Wilcox, Gladys Wilcox and F. L. Bash.

Natural Rock Asphalt Co., St. Louis, Mo. Lowell Sparling, International Life Bldg., St. Louis.

Wisconsin Black Granite Corp., Wausau, Wis., 100 shares, $100 each. C. Ninneman, H. Ninneman, V. Callaway and H. Hoffman.

Dudley Black Quarry Co., Gleason, Wis., 250 shares, $100 each. R. Dudley, W. E. Dudley, P. Van Hecke and M. Van Hecke.

Ham-Lin Cement Products Co., Garden City, N. Y., increased capital stock from $6000 to $25,000.

Glenwood Sand and Gravel Co., Eugene, Ore., $25,000. E. C. Wilfert, M. O. Wilfert and Whitten Swafford.

McMillan Fireproof Fibre Co., Chicago, Ill., $25,000. To deal in cement, gypsum and other building materials. U. S. McMillan, D. T. Turner and A. G. Duncan, 120 S. La Salle St., Chicago.

Brevoort Gravel Co., River Front, Mt. Carmel, Ill., $50,000. Produce and sell sand, gravel, brick, cement, etc. W. R. Kimsey, E. C. Resnquist, Vivian Resnquist, N. L. Eastman and H. W. Seitz.

Quarries

John Jehle of Alton, Ill., has opened a quarry at Grafton, Ill.

Oliver Buland, Fairbury, Ill., has begun operations at his rock crushing plant northwest of Fairbury. In addition to crushed rock for road building and general building purposes, limestone for agricultural fertilizing is being produced.

Cloverport, Ky. Edward Gregory of the Commercial Club here advises the Chamber of Commerce is interested in establishing a plant for developing lime rock and has succeeded in interesting local capital in the project.

Cleveland Quarries Co., Berea, Ohio, had a fire recently which did damage estimated at $180,000. The fire broke out in a stone sawmill and destroyed the structure before firemen could bring the flames under control.

Connersville, Ind. Contract has been let for stripping the new quarry to be opened by Ben Crowe southwest of the city. The land has been core drilled and found to contain a fine quality of oolitic limestone, the report states.

Columbus, Ohio. A move to acquire 60 acres of land along the west bank of the Scioto river just north of Hayden Run road, to forestall possible stone quarry operations, was instituted by the city council here recently.

Weston and Brooker Co., Columbia, S. C., recently received an order from the government for 600 cars of jetty stone to be shipped to Miami, Fla. Ten cars will be shipped daily, and complete delivery will take several months.

Quarry Products Co., Menasha, Wis., has been awarded a contract by the state of Michigan for a large excavation job about 150 miles north of Iron Mountain. It is expected that it will take seven months to complete the cut, and approximately 35,000 yd. of material will be removed.

North Carolina Granite Corp. and the **J. D. Sargent Granite Co.**, Mt. Airy, N. C., have moved into their new four-story office building, northwest of the main quarry. The building, constructed of Mt. Airy granite, has all the newest improvements and is of fireproof construction throughout.

Rockland, Wis. At a special election held here recently the electors decided in favor of the purchase of a new stone crusher instead of expending money in repairing the old one. The crusher is used in crushing stone for road work at the several pits about the town.

Journal Building Co., Portland, Ore., has agreed to a compromise with the county commissioners in the suit concerning the Beard's Hollow rock quarry site. The company had held out for a price of $3000, while the commissioners, in their condemnation suit, offered $275. The compromise figure was $1250.

C. C. Stallings' limestone quarry, Silverdale, Kan., is now operating. The stone will be used for manufacturing commercial lime by a process perfected by Mr. Stallings. Some stone will be ground for fertilizer purposes. Associated with Mr. Stallings is J. W. Vohris of Elliston, Mont., who is manager of the new company.

Sand and Gravel

J. E. Carroll Sand Co., Buffalo, N. Y., has been merged with the Buffalo Slag Co., Buffalo, N. Y.

Ellisville, Wis. The county gravel crushing and screening equipment has been installed in the gravel pit on the Louis Borchardt farm.

W. D. Hilton, who operates several pits in Mississippi, has bought holdings in the gravel lands around Columbus, Miss., and is opening up a plant there.

Byron, Ill. Chicago and Northwestern railroad has opened its gravel pit near here. Shipments are expected to be exceptionally heavy this year, and most of the gravel shipped will go west of Dubuque, Iowa.

Redgranite, Wis. A new gravel pit is being opened on the Ernie Blaise farm at Casters Corners by the Lampert Construction Co. of Oshkosh, Wis. The gravel will be used in the construction of new pavings on highways 21 and 49.

Griffith-Consumers Co., Washington, D. C., is reported to have acquired a site in Silver Springs, Md., for a $100,000 plant for distributing building material, etc., to be built this fall.

Western Indiana Sand and Gravel Co., Winona Lake, Ind., has purchased the Hart Brown farm, Leesburg, Ind., and has already constructed a sidetrack from the Winona Interurban railroad and is engaged in transporting gravel from the farm's pits to State Road No. 15, north of Leesburg.

Escondido Rock and Cement Co., Escondido, Calif., has established a plant with modern equipment at the foot of Poway grade. The rock crushed is a hard wash gravel. The company also plans to construct a warehouse and bunker in Escondido.

Champion Sand and Gravel Co. has started work on its new plant at Beechwood, about eight miles west of Iron River, Mich. A site comprising 25 acres of gravel-bearing land was recently purchased. Railroad grades are now being prepared and the building will soon be under way.

Standard Gravel Co.'s new plant, being built on the Ouachita river near Fort Lookout, northeast of Camden, Ark., is progressing rapidly. Several barges to be used in carrying the excavated gravel and sand from the river's bed have been towed upstream to the plant. John Sanders, Shreveport, La., is president of the company.

Fountain Sand and Gravel Co., Pueblo, Colo., has obtained the permission of the county commissioners to construct a narrow gage railroad track across the county road south from the stock yards to the intersection of the Santa Fe trail. The 36-in. track will be used for the operation of locomotives and cars to transport sand, gravel and other materials from the pit to the screening plant.

Algona, Iowa. Contracts have been let by the Kossuth board of supervisors for 86,000 cu. yd. of gravel for use in improvements and repairs on secondary roads in the county. Vandershaaf and Vanderstouee of Hull, Iowa, combined with J. A. Huff in making a joint bid for the contracts. Their bid was 24c per cu. yd. for crushing, loading and hauling one mile, and 10c per cu. yd. for stripping.

Bethany, Mo. The state highway department has been interested in the development of 35 acres of gravel land in the western part of Bethany. The project is being promoted by Dighton Wilson, Dr. J. G. Hinkle, L. R. Kautz and P. G. Wightman, all of Bethany. Tests are being made of the material and, if it comes up to expectations, it is expected that the state will contract for the entire output for highway construction.

Edward Sidebotham and Sons, San Pedro, Calif., have purchased the 11-acre holdings of the Hollingsworth Sand and Gravel Co., Los Angeles, Calif., and will begin operation of the pit at once. A 2½-acre tract at Normandie avenue and Anaheim, near Harbor City, Los Angeles, has also been purchased and following the completion there of a concrete warehouse and 600-ton bunkers, business headquarters will be transferred from San Pedro to the Harbor City location.

Cement

Volunteer Portland Cement Co.'s plant at Cowell, Tenn., is now turning out 2850 bbl. daily. The maximum capacity of the plant is 3000 bbl. and it is expected that this figure will soon be reached.

Three Forks Portland Cement Co., Trident, Mont., having a stock of 350,000 bbl. on hand, will suspend production for a short period, according to reports. Cement orders will be filled as usual during the shutdown.

Superior Portland Cement Co.'s western Washington dealers were recently escorted by Percy Lucas, president, and other officers of the company on an inspection tour to the company's plant at Concrete, Wash.

Kosmos Portland Cement Co., Louisville, Ky., donated $300 for awards to the farm practice teams at the ninth annual Junior Week held at the University of Kentucky, Lexington, Ky., June 10-15. Five hundred boys and girls selected from 20,000 agricultural clubs attended.

Chelsea, Mich. Tentative approval of a new $34,000 storage structure for the state cement plant here has been given by Governor Green. Superintendent M. H. McGaffigan has been requesting the addition to the plant for some time, and Governor Green approved the request pending further investigation.

Huron Portland Cement Co. has acquired 168 ft. of waterfront property along Maumee river, Toledo, Ohio, which will be developed for a cement storage and distributing terminal. The company operates similar distributing elevators at Cleveland, Detroit, Duluth and Buffalo, all served by boats carrying cement in bulk from the Huron company's plants at Wyandotte and Alpena, Mich.

Agricultural Limestone

Hawkeye, Iowa. A total of 1000 tons of agricultural lime was recently shipped here, to be spread on the 780 acres owned by the Collins Farms Co. of Cedar Rapids, Iowa.

Iowa. Two farmers' elevators, one at Norway and one at Blairstown, Iowa, are now storing agricultural limestone for use of farmers in this community. Charles Buchanan is manager at Norway and J. E. Pedersen is manager at Blairstown.

Cement Products

John H. Geis and Co., Inc., Brooklyn, N. Y., has acquired the plant of the Cast Stone Co. at Third and Maryland Ave., Brooklyn.

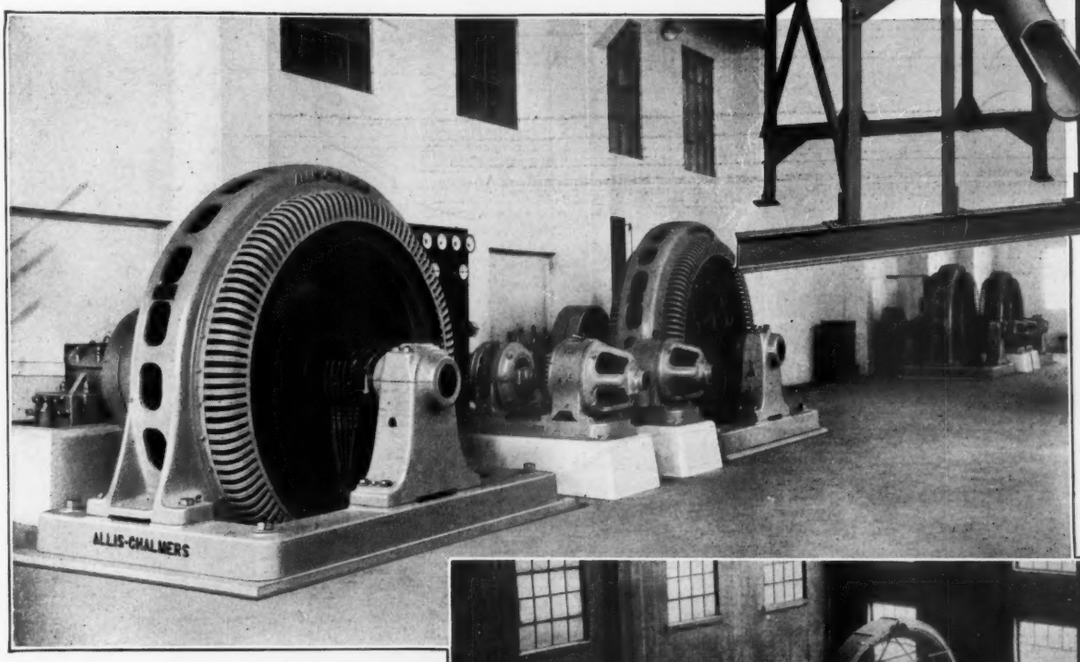
Concrete Pipe and Products Co. has been awarded a $35,000 contract for concrete piping by the city of Hopewell, Va.

The Maul Co. of Illinois, Chicago, manufacturers of precast stone, has leased for five years the building at 5821 West 66th St., Chicago.

Houston Art Stone Co., Houston, Tex., has purchased a new plant site at Leeland Ave. and Hughes St., on the Houston Belt and Terminal, for

Quality Machinery for Quality Products

Table Feeder



Hytork Motors

Compeb Mills

EVERY producer appreciates that specifications for Portland Cement are constantly growing more stringent and that the quality of their product is dependent to a great extent on their feed regulating and grinding equipment. The Allis-Chalmers Manufacturing Company, with its testing laboratory and co-operation with the cement industry, has anticipated this demand.

Automatic Feeders have been designed in various types and sizes to control the correct proportions of raw material within close limits and to maintain the highest unit capacity.

Compeb Mills and Concavex grinding media have been designed to give the proper fineness of raw material and finished cement.

"Hytork" Synchronous Motors are direct connected to grinding mills without any unloading device such as a friction or a magnetic clutch and are capable not only of exerting unusually high starting and "pull in" torque with very little line disturbance at high power factor, but of operating at unity power factor.

Allis-Chalmers' cement machinery is noted the world over for its simplicity and economy of operation and the high quality of cement produced.

ALLIS-CHALMERS
MILWAUKEE, WIS. U.S.A.

a reported price of $10,000. Charles Marini is president of the company.

Excell Concrete Block Co., Mt. Healthy, Ohio, is now under new management. The company has introduced a new type of concrete container for garbage buckets which has met with a successful reception. L. F. Lutkehaus is the new general manager.

Miscellaneous Rock Products

Custer, So. Dak. An onyx quarry, believed to be the largest deposit of its kind on the continent, has been opened near this city.

Certain-teed Products Corp., New York City, expects to begin work soon on its new roofing plant, which will have an initial capacity of about 1,500,000 squares yearly. Engineers for the new plant and the name of the subsidiary have not yet been decided upon, but it is expected that the plant will be completed by January 1, 1930.

Mexico Refractories Co., Mexico, Mo., has been organized to mine, manufacture and deal in fire clay and refractory materials. The new concern, which is headed by J. B. Arthur, has leased over 500 acres of land south of Mexico for development. R. D. Rodgers and J. W. Buffington are associated with Mr. Arthur in the project.

Apex Quartz Co., St. Clair, Mo., recently incorporated for $50,000 to develop a ganister deposit, is getting well under way in the installation of equipment and will soon begin to operate. It is expected that the plant will crush an average of 125 tons daily. Election of officers was recently held and the following chosen: Dr. C. F. Briegleb, president; J. W. Steinbeck, vice-president; L. E. Roberts, treasurer, and O. L. Gard, secretary.

Personals

Dr. William K. Hatt of Purdue University has assumed direction of the Building Code Committee of the U. S. Department of Commerce.

G. Henry Way has resigned as research associate for the Gypsum Industries at the U. S. Bureau of Standards, to accept a position with the Structural Gypsum Corp., Linden, N. J.

John E. Russell, president of Consolidated Sand and Gravel Co. and Standard Paving and Materials, Ltd., Toronto, Canada, has been elected a director of Canadian Dredge and Dock Co., Ltd.

L. H. Moule, for 12 years associated with R. H. Beaumont Co., Philadelphia, Penn., has been appointed sales engineer of the company at the Philadelphia office.

K. C. Provance, formerly works manager of the Koppel Industrial Car and Equipment Co., has joined the Easton Car and Construction Co., Easton, Penn., as sales manager.

Alfred Kauffmann, president of the Link-Belt Co., Chicago, Ill., gave a very comprehensive address at the sixth annual convention of the National Association of Foremen, at Indianapolis, Ind., on Saturday, June 8. "Some Trends in Industry" was the subject.

H. G. Overholt, former chief architectural engineer for the Chicago board of education, and **H. J. Carton**, a former associate of Benjamin H. Marshall, architect, have been appointed structural engineers for the Portland Cement Association, assigned to the midwestern territory.

Professor F. C. Lincoln of the South Dakota State School of Mines, Rapid City, So. Dak., a frequent contributor to ROCK PRODUCTS, has left for Castle Rock, Wash., to engage in mine examination work. Professor Lincoln recently completed a report on the Gold Lode mine, near Hill City, So. Dak.

Charles E. Fontaine, sales manager of the Lone Star Portland Cement Co., Norfolk, Va., addressed the Norfolk Rotary Club recently on the advantages of modern quick-setting concrete and its use in meeting difficult engineering requirements. Mr. Fontaine also discussed the fight being made by the American cement manufacturers to obtain a protective tariff to protect the home product from lower priced foreign cement.

Obituaries

F. H. Eugene Weil, 62, superintendent of the Andres Stone and Quarry Co., Milwaukee, Wis., was killed in an automobile accident on June 12.

Iver S. Theobald, 15, son of a United States Gypsum Co. official, was killed at Chicago on June 15 when a toy cannon he was making for the July Fourth celebration exploded.

Oliver Ames, senior member of the board of directors of the General Electric Co., Schenectady, N. Y., died at his home in North Easton, Mass., on June 18. Mr. Ames, 65 years old, had been a member of the board since 1893, having been elected at that time to fill the vacancy caused by the death of his father.

Capt. William W. Maclay, 83, former president and general manager of the Glens Falls Portland Cement Co., Glens Falls, N. Y., died June 9 at his home in Lee, Mass. He was the first president of the cement company, serving from 1893 until 1905, when he was succeeded by George F. Bayle, Sr.

Mr. Maclay was a graduate of the U. S. Naval Academy and commanded the Asiatic squadron immediately after the Civil War. After his resignation from the navy in 1871, he became engineer for the New York Department of Docks and it was under his regime that many of New York's large docks were built.

He was quite active in the early affairs of the Portland Cement Association, serving as a member of many of its leading committees.

Manufacturers

Patterson Foundry and Machine Co., East Liverpool, Ohio, is to have a large addition to its machine shop division, to cost over $150,000 and which will increase the capacity of that department 50%.

Stephens-Adamson Manufacturing Co., Aurora, Ill., has appointed H. W. Newton as district manager of the Birmingham, Ala., office to succeed W. E. Harris. Mr. Newton's office will be at 1108 Martin Bldg., Birmingham, Ala.

Manganese Steel Forge Co., Philadelphia, Penn., has appointed Wells, Fargo & Co. Express S. A., Apartado Postal 361, Mexico, D. F., as sales representatives in Mexico for their products.

A. P. Green Fire Brick Co., Mexico, Mo., has purchased seven pieces of property at the east end of East Breckenridge St., Mexico, Mo., which it is expected will be used for additional operations of the company.

General Refractories Co., Philadelphia, Penn., announces that its Buffalo office is now located at 1210 Genesee Bldg., Buffalo, N. Y., and its Cleveland office is now at 1126 Leader Bldg., Cleveland, Ohio.

Perfex Corp., Milwaukee, Wis., announces that John W. Tambert, formerly in charge of the cost and manufacturing departments, has been promoted to secretary and treasurer, succeeding C. G. Phelps, who recently resigned.

Schofield-Burkett Construction Co., Macon, Ga., announces the appointment of John Walker, formerly connected with the engineering department of the Dorr Co., as manager of its eastern sales office. Mr. Walker will be at 150-02 Sixth Ave., Whitestone, N. Y.

Harbison and Walker Refractories Co., Pittsburgh, Penn., has acquired the Fulton Fire Brick Co., Fulton, Mo., through an exchange of stock in their company for the Fulton properties. L. U. Nickel, president of the Fulton Fire Brick Co., will continue with the company.

Foote Bros. Gear and Machine Co., Chicago, Ill., announces the appointment of S. Howard Eisenberg, 2812 Ash St., Denver, Colo., as district representative for Colorado, Wyoming and New Mexico. The company has also established a western sales office at 1855 Industrial St., Los Angeles, Calif., under the supervision of E. D. Bennett, in charge of the reducer and gear division, and A. N. Hendersen in charge of the road machinery division.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Pull Shovels. Broadside outlining special features of heavy duty pull shovel of KOEHRING CO., Milwaukee, Wis.

Air Drying Pulverizer. Bulletin on automatic pulverizer equipped with air drying and air separation in combination. RAYMOND BROS IMPACT PULVERIZER CO., Chicago, Ill.

Buckets. Illustrated folder on various types of buckets, including clam shells, orange peel, and drag scraper buckets. THE HAYWARD CO., New York City.

Diamond Drill Equipment. 55-page catalog, **No. 85-B**, covering equipment and supplies for diamond core drills. SULLIVAN MACHINERY CO., Chicago, Ill.

Cranes and Hoists. Bulletin on traveling cranes and electric hoists, from ½ ton to 450 tons capacity. SHEPARD-NILES CRANE & HOIST CORP., Montour Falls, N. Y.

Rails and Trackage Accessories. Bulletin covering line of standard and relaying rails and accessories, such as bolts, nuts, tie plates, spikes, braces, switches, etc. L. B. FOSTER CO., Chicago, Ill.

Combined Barometer and Vacuum Recorder. Bulletin No. **150**, describing this instrument for steam turbine operation. UEHLING INSTRUMENT CO., Paterson, N. J.

Electric Ventilation. Folder on application of electric ventilating equipment for plants where the removal of bad air, odors, fumes and high heat is necessary for satisfactory operation. AMERICAN BLOWER CORP., Detroit, Mich.

Lockstrip for Cement Floors. Folder covering T. M. C. brass strips used to replace scoring in cement finish and to form ornamental outline of floor panels of one or more colors. LOCKSTRIP MFG. CORP., Lng Island City, N. Y.

Equipment for Material Yards. Folders covering self cleaning bins with volume weighing "AggreMeter," clamshell and electric buckets, traveling cranes, scrapers, diggers, etc. ERIE STEEL CONSTRUCTION CO., Erie, Penn.

Power Transmission Machinery. 500-page catalog, **No. 42**, covering complete line of speed reducers, cut gears, pulleys and general power transmission machinery. W. A. JONES FOUNDRY AND MACHINE CO., Chicago, Ill.

Riveting Hammers. Bulletin on Boyer riveting hammers with improved hardened and ground valve unit. Completely illustrated with sectional views and specifications. CHICAGO PNEUMATIC TOOL CO., New York City.

Material Handling Machinery. Bulletin **No. 164** covering unusual installation for reclaiming stone and sand for delivery, and outlining special features of design of the "Rollway" bin gate. STEPHENS-ADAMSON MFG. CO., Aurora, Ill.

Wheel Graders. Illustrated broadside describing leaning wheel graders, straight wheel graders and rip-snorters in various sizes and styles to meet every grading need. AUSTIN-WESTERN ROAD MACHINERY CO., Chicago, Ill.

Pneumatic Conveyors. Bulletin **No. 501** explaining operation and fundamental principle of "Dracco" high vacuum pneumatic conveying suction systems for handling bulk materials. THE DUST RECOVERING AND CONVEYING CO., Cleveland, Ohio.

Variable Reducer Transmission. Bulletin covering variable speed transmission and speed reduction units designated as Types R and RG in six sizes. Completely illustrated and giving speed and power schedules. STEPHENS-ADAMSON MFG. CO., Aurora, Ill.

Business Research—What it is and how to use it comprehensively explained in a folder entitled "Militant Business," covering such interesting subjects as management research, technical research, marketing research, etc. BARRINGTON ASSOCIATES, INC., New York City.

Air-Jacketed Motors. Bulletin No. **151**, third revision, containing a discussion of dust, fume and moisture problems requiring special protection for motor and property, and pointing out how the construction features of Wagner air-jacketed motors has solved these problems. WAGNER ELECTRIC CORP., St. Louis, Mo.

Welding. Illustrated sheets, issued fortnightly, on various phases of the application of welding as applied to the manufacturing of machinery and equipment. Also monthly series of "Studies in Structural Welding," showing the latest applications of welding to sructural work. LINCOLN ELECTRIC CO., Cleveland, Ohio.

Coating System. Illustrated folder on the "MetaLayeR" system for protecting machinery, etc., from corrosion. Folder tells how device simultaneously melts, atomizes and applies a coating of molten metal of any desired thickness. METAL COATING CO. OF AMERICA, Philadelphia, Penn.

Air Compressors. Illustrated bulletin, designated as No. 144, describing duplex air compressors in the single stage and two-stage types of compression. The bulletin, which also devotes considerable space to the advantages of the synchronous motor drive, is of interest to all air compressor users. PENNSYLVANIA PUMP AND COMPRESSOR CO., Easton, Penn.

Thermometers and Flow Meters. Catalog **No. 65**, covering indicating and recording thermometers for measuring temperature from 40 deg. F. to +800 deg. F., and Catalog **No. 93**, covering resistance thermometers for measuring temperatures from 300 deg. to +1000 deg. F. Also folder on flow meters showing various applications. BROWN INSTRUMENT CO., Philadelphia, Penn.

Stokers. Completely illustrated booklet, designated as **MR-1**, describing fully multiple retort underfeed stokers of super-station type. Also reprint of article entitled "Pulverized Coal for Metallurgical Work," reviewing prevailing practice in burning of powdered coal, and notable economies effected. COMBUSTION ENGINEERING CORP., New York City.

Baffles of Various Types. The current issue of "The Safety Valve," **No. 17**, contains an article, "Baffling for Straight Tube Boilers" by Walter Seigerist, illustrating and describing various types of baffles, their relation to straight tube boilers, and various types of baffle arrangements to meet certain combustion requirements. COMBUSTION ENGINEERING CORP., New York City.